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Original Contributions.

HOW TO MAKE GOLD FILLINGS.

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(Continued from page 1077.)

There are four fundamental principles that must always be borne in mind in making gold fillings, or indeed fillings of any kind:

1st. The outline form.
2d. The resistance form.
3d. The retentive form.
4th. The convenience form.

The outline form involves the doctrine of extension for prevention and the esthetic form.

It would seem scarcely necessary to emphasize the importance of obtaining sufficient extension of the margins of the cavity to bring these margins into territory of relative immunity to decay, inasmuch as so much has been written upon the subject in the past few years. But as I see men operating at our clinics, and as I see the result of operations as they present in patients coming to me from other men, I am impressed with the fact that the last word has not yet been said upon the subject. If we are to accept the microorganic theory of decay, then we must, if we are to be honest with ourselves and with our patients, make our fillings in such a way that the cause of the primary decay will not be operative after we have made our filling. If we believe that the cause of decay lies in the inherent weakness of the tooth, then it matters little how we prepare our cavities, or how we fill the tooth, for if it was so weak in its perfection that it could not withstand caries, surely it will not be able to hold out long after it has been filled, even though perfectly done. But we do know that teeth that

have been decayed and have been filled in a scientific manner have resisted the influence of caries for years, even though the other teeth in the same mouth have been the subjects of repeated attacks. And we also know that fillings that have been made without sufficient extension have repeatedly failed. After I had read a paper upon this subject before one of the prominent eastern societies, a professor of operative dentistry in one of our best colleges arose and began an attack upon the doctrine of extension. After he had finished and I had answered his objections he said: "I remember that on numerous occasions I have filled cavities in teeth and have cut them just enough to remove the decay and lose as little tooth substance as I could, and I have had those teeth come back to me time after time, until I had filled some of those cavities four or five times, and then decay would cease and I thought that the patient had arrived at a period of immunity, but I now know that I had finally carried the margins of my cavity into immune territory and so decay had ceased."

It takes a brave man to confess his failures, but such a man is always a progressive man. His experience is the experience of every man that is not following extension for prevention. His experience was my experience until the happy day when Dr. E. K. Wedelstaedt clubbed some sense into me and made me see the truth, and now, after ten years of experience, I do not see fillings returning with a recurrence of decay, and I am not afraid to see old patients come into the office. That all cavities should be cut far enough to carry their margins into territory of relative immunity, is Dr. Black's axiom. But just what does that mean? It means that all margins shall be in such a position when the filling is made that they will be kept clean by the excursion of the food in mastication, the movements of lips and cheeks, and the use of the toothbrush; and the gingival margins shall be carried far enough to be covered by the gum; for another of Dr. Black's truisms is that "caries never occurs under healthy gum tissue." Therefore the gingival margin must be carried up far enough to be under the gums, the buccal and lingual walls along their entire extent from gingival to occlusal surface must be carried out far enough to be entirely free from the approximating tooth, and the occlusal or incisal margin must also be perfectly free from con-

tact with the approximating tooth. In no place should tooth tissue touch tooth tissue after the filling is completed. We believe that decay is caused by a microorganism that fastens itself upon some surface of the tooth that is protected from the movements of cheek, lips, and the food in mastication, and is therefore able to fasten itself upon such surface, and, protecting itself by a gelatinous film, carry on its destructive work. If that it true, then if we can prevent the adhesion of these organisms to the teeth we can prevent decay, and clinical experience bears out this hypothesis, for where the margins of a filling are carried out far enough to be kept clean, and they *are* kept clean, we never have a recurrence of decay.

We are frequently accused of cutting a tooth to pieces in order to carry out our ideals. This is not true, and is only made by men that have no conception of the proper manner of applying this much abused but grandest doctrine that has ever been given to the dental profession. It is not necessary to cut a tooth to pieces, but it *is* necessary to cut far enough to bring the margins of your cavity into immune territory if you are going to save the tooth. For, if I may repeat a paraphrase that I gave before the Black Club some years ago, "What shall it profit your patient if you save a millimeter of enamel and lose the whole tooth?"

The outline form also involves the esthetic form, and it is our duty to make every filling as beautiful as possible, or, better perhaps, as least disfiguring as possible commensurate with tooth salvation. If the patient comes to us to have the tooth saved, it is our duty to save that tooth, and to use the material and the method that will best and most permanently accomplish the result. At the same time, it is our duty to use the material and method in the way that will make the best appearance possible. We realize that gold in the incisors is to a greater or lesser extent disfiguring, and when it must be used the filling should be so made that it will be as sightly as possible. We must bring the gold into view if we are to carry out our ideas of extension, and if we do not, we cannot promise the patients a permanent operation. If utility and permanence is the first consideration, then the cavity must be cut freely so that the gold will, of necessity, show considerably, and I think it is better so, for gold looks better when it shows plainly

than where there is an attempt to hide it, and it looks like a black spot between the teeth. Curves are always more beautiful than angles, and the form of the filling at all angles should be a graceful curve. Square, clumsy looking angles should always be avoided. While the interior of the cavity should be box-shaped, the outline form should be one of rounded angles. We should be at all times honest with our patients and honest with ourselves and look the matter squarely in the face. If it is permanence we want, let us use the means to obtain it, even at the loss of beauty, to some extent. But if it is a question of esthetics first, and the patient has a right to demand it if she wills, then let us use the means that will give the greatest beauty even if we sacrifice some ideals of permanency, but let the patient distinctly understand the position we are taking.

The resistance form is that form that must be given a cavity in order that the filling may be able to resist the stress that may be brought upon it in mastication, and this form is one that must be given a cavity after a careful study of the occlusion and the amount and direction of the stress. In filling teeth we must be careful not to become routinists and fill every cavity in every tooth just alike. There are few general rules that can be given, except that the fillings should always be seated upon a flat base, for we know that no form is so well able to resist stress without movement as a flat base, and all fillings in the mesial surfaces of the upper teeth and in the distal surfaces of lower teeth should have broader and deeper resistance forms than cavities in the opposite surfaces of the same teeth for reasons that were pointed out in a former paper. And all cavities that extend over the incisal surfaces of teeth should be deep enough to allow for a sufficient mass of gold to resist the forces that may be brought to bear upon them. But these problems will be taken up as we describe the cavity preparation in the individual cases.

The retentive form that has been adopted by the followers of Dr. Black does away entirely with the old forms of undercuts, grooves and pits, for we recognize that these seeming aids to the retention of gold fillings are delusions and snares, and are a source of weakness rather than strength, In the first place, a groove or a pit that undermines the enamel leaves the enamel in

a very weak condition indeed, for we know that enamel unsupported by dentin is very weak. We find very many examples of teeth that have been filled in that manner breaking down because of such treatment, but a reason that is perhaps greater than that is the fact that it is very difficult to fill a series of grooves and pits in a cavity with gold, and have the cavity perfectly sealed. The ideal cavity is a square box, and the nearer we approach this ideal the more nearly perfect will be our cavity. The rule is flat seats and parallel walls. I frequently have men ask me if I expect to make a filling stay in such a cavity after I have finished my preparation, and then after I have finished placing the gold and am finishing the filling with knives and saws the same individuals will express surprise at the seemingly careless manner of finishing, saying that they would not dare do so to one of their fillings for fear of pulling it out. Neither would I dare do it if I depended upon a groove or a pit to hold the filling, for I might fear that the gold in the pit or groove would break and then the whole filling would come out. But when a mass of gold is malleted solidly into a square cavity either the tooth or the gold is going to break before the filling comes out.

The convenience form is a most important consideration in filling teeth with gold. For we cannot perfectly fill a tooth with gold in which we cannot obtain perfect access to every portion of the cavity. It is said that a certain dentist went to Dr. Black's office and spent a week watching him operate and when he returned he said, "Yes, he is a wonderful operator and made some most beautiful fillings, but in all the time that I was there he did not fill a difficult cavity;" and he did not because he made all the cavities easy of access. And today this system is not only the most perfect system that has ever been devised for the filling and saving of teeth, but it is the easiest. In the past men cried out in horror that we were needlessly sacrificing good tooth-structure and they would not do that, and now? Now these same gentlemen are cutting and hewing good tooth-structure with a vengeance in order that the wax for their inlay will withdraw. Among the many good things that the inlay is accomplishing, for I do not disparage the inlay in its place, the fact that it is causing its devotees to cut their cavities wider and deeper, is going to be the cause of more teeth

being saved than the mere placing of the inlay is going to accomplish. The rule for the convenience form then is to cut your cavity in such a manner that you can have perfect access to all parts of it with your plugger point.

We will divide our cavity preparation into cavities in the approximal surfaces of incisors, cavities in the incisoproximal surfaces, cavities in the labiolingual surfaces of incisors and labiobuccal surfaces of bicuspids and molars, cavities in the distoincisal surfaces of cuspids, cavities in the proximoocclusal surfaces of bicuspids and molars, cavities in the occlusal surfaces of bicuspids and molars, and cavities in pits in the lingual surfaces of incisors and buccal surfaces of molars.

The instruments that are necessary to a proper and speedy attainment of the results arrived at are, first, an assortment of the best burs, always sharp, of course. It is the worst possible economy that a man can practice to use dull burs or instruments of any kind. After all the obtundants and schemes for desensitizing dentin shall have gone their way we will continue to get results with a sharp bur and excavator properly handled. Cut from and never toward the pulp, use a rapidly revolving bur with a gentle touch and the cavity can be quickly prepared and comparatively painless. But use the bur as little as possible and use the hand instruments as much as possible, and as you become proficient in their use you will be surprised how easily you can accomplish your purpose. And second, in addition to burs have an abundant supply of chisels, hoes and excavators, all exquisitely sharp. The Wedelstaedt working set is advised for the cutting instruments, but for those that cannot obtain the Wedelstaedt set I have prepared a list that can be obtained at any of the dental depots. I have found a great deal of difficulty in the past in obtaining the proper instruments for students, but with this list and the Black instruments obtainable anywhere, the difficulty is reduced to a minimum. There should be as many duplicates of these instruments as the operator can afford, for an instrument should never be used but once and should then be put away and not be placed back in the cabinet until it is sharpened and sterilized. I find it convenient to have at least a half dozen of each instrument, and then as I use one I drop it into a compartment in my cabinet pre-

pared for that purpose; and there it remains until I have the leisure to sharpen it, when it is sterilized and replaced in the cabinet. These instruments are usually sharpened and sterilized at the close of the day's work, so that if there were not a large number of duplicates one would be compelled to stop in the midst of an operation and prepare his instruments.

The list is as follows:

Hoes—

Black's	8-3-12
	6-2-12
	12-5-12
	10-4-6
	14-6-6

Chisels—

Wedelstaedt's	39
	42
	43
	44
Black's	20-9-12 Right and Left
	15-8-12 " " "
	10-6-12 " " "

Pluggers—

Wedelstaedt's	6, 7, 8, 10, 11, 12, 17, 19
Black's	Back Action.
	1, 2, 7
S. S. W.	Foot Plugger, 100
Black's	Knife No. 7.
Black's	Saw Frame and Saws.
Wedelstaedt's	Interproximal Trimmers.
Wedelstaedt's	Interproximal Knives.

(To be continued.)

THE CHEMISTRY OF EVERYDAY LIFE.

BY BESSIE BURNS BENNETT, D.D.S., BALTIMORE, MD.

Had Bacon done no more for science than initiate his fellow men into the idea that science was not a thing to be relegated to the few but shared by all alike; had this been the chief result of the great man's life, the legacy to the world would have been a valuable one. Today we realize that science pervades every action, and that consciously or unconsciously the humblest is influenced by its laws. For that reason it is well to be familiar with some of its commonest phases.

Of all the many sciences, there is none so far-reaching, none so general in its adaptation, none so worthy of study and none more broadening to the student than chemistry. The greatest of natural phenomena must find its cause in this or a sister science; the most trivial and seemingly unimportant everyday occurrence is due to the same effects. The sustaining of life in the acts of breathing, digestion, circulation, is dependent throughout upon chemistry, while death and the after changes in the body are likewise the result of chemical action.

That Bacon's conversion of the world to the powerful influence of science is not even in our time perfectly accomplished is proven by the skepticism of many so-called educated people of today, whose thoughts were well expressed by a seventeen-year-old patient when she said: "What good is chemistry, anyway? It seems to me the only good it does is to addle your brains with formulas, and it's only a few old fogies who really are interested enough to actually study it, and they get blown up now and again for their pains."

How many of the world there are who would answer to the same sentiment had they the candor of seventeen, and not the wisdom which comes from experience and teaches that "silence is golden?"

To say that chemistry is uninteresting and unimportant, when the very rain comes down by a chemical means (the saturation of the atmospheric air); when the beautiful snow that robes the earth in its winter dress is a continuation of the same process; when the bread we eat, and call the staff of life, becomes bread only

through the most beautiful chemical process; when the coal which supplies heat and motive power would never had been had not the kind Creator changed the buried vegetable matter by a slow decomposition from the useless mass to one of the necessities of life. Would there be any oil, the poor man's standby, and the rich man's gold mine, had not the animal fats by a process of destructive distillation yielded it in the interior of the earth?

In the destructive distillation of coal or wood some of the most valuable substances known to science are obtained, phenol, one of the best antiseptics and disinfectants we have, being of the number.

Electricity, that powerful agent, which gives heat and light; retards disease; restores dwindling vitality; in cases has even been known to relight the flame of life which had seemingly gone out; which sends the lightning message between points thousands of miles distant; which drives engines and motors; which, in the form of lightning, wreaks such disaster; this power which has been theorized upon since Thales first noticed its working thirteen centuries ago, and which, like the Deity, has never fully revealed itself to man, this intangible, wonderful substance comes at the bidding of the wizard chemistry. In the treatment of virulent poisons life is saved by chemical means, the antidote being an agent which will counteract or neutralize the toxic drug. It would be a good idea if parents would study the simpler acids and alkalis so as to be fully prepared for action in case of an emergency.

Indeed, life itself, which the most of us seem to value so slightly until grim fate threatens to clip the slender thread, life itself is supported and sustained by the action of chemical change. Is a science of no account, which, in the still watches of the night, when, as far as ourselves are concerned, we lie dead; is the science of no account which, under the guidance of the Omnipotent, with no influence whatever of the individual, carries on the workings of the system, restores tired, worn-out tissues and fits us for the battle when consciousness shall return?

Every change occurring in our bodies is of a chemical nature. In digestion the action is a chemical one from the initiative. The food, as it is being crushed and ground by the teeth, comes into contact with the first enzyme, the ptyalin of the saliva, which acts upon a portion of the free starch, changing it into maltose. In

the stomach the gastric juice acts in various ways. The acidity of the gastric juice is due to the free hydrochloric acid present, in from .1 per cent to .4 per cent. Pepsin, an important constituent of the gastric juice, acts in the presence of free hydrochloric acid and changes proteids into albumoses and finally into peptones. Rennet is another active principle of the gastric secretion, which coagulates milk, precipitating the casein.

In the intestinal digestion, the bile assists in emulsifying fats, promotes their absorption, and probably one of its most important functions is its antiseptic action. The chyle, a milky, creamy substance, the result of digestion, renews the energy of the blood. This fluid enters the circulation by the portal vein, into which it is absorbed from the intestines by osmosis. A portion of the emulsified fat is absorbed by the lacteals, carried by them to the thoracic duct, and thence transported to the venous circulation at the junction of the jugular and subclavian veins.

In respiration, again, the changes are chemical. The blood passes through the body, yielding its life-giving qualities to the tissues it passes through, and at the same time taking up impurities; CO_2, which is carried in the blood plasma, with which it becomes incorporated; traces of ammonia, water vapor and other impurities. From the fresh air inspired the blood extracts its oxygen, without which the body could not live, and distributes it to the various organs, by incorporating it with the hemoglobin, which gives arterial blood its bright red color. Venous blood on its return to the heart is of a dark dull color, owing to the fact of its having parted with its hemoglobin.

In the kidneys the blood again undergoes a chemical transformation, losing waste products. It is for this reason that kidney trouble is generally productive to serious ill all over the body, as these waste products, instead of being taken away from the body, remain and act as toxic poisons to the whole system.

So we see that the four great processes by which the human body is kept in working order, digestion, respiration, absorption and circulation, have each step of their way marked by chemical guideposts.

In our own profession, chemistry indeed is king, except in the purely mechanical branches, and indeed even in these the adjuncts

are chemical, as the vulcanizing of rubber and the making of porcelain teeth. Let us begin with the simplest operations. In the removal of tartar from the teeth we deal with a substance which is the result of a precipitation of salts held in solution by the saliva. This tartar will be found more often in mouths the saliva of which shows a distinctt alkaline reaction. That the tartar acts chemically is shown by the roughened condition of the enamel beneath it; the process is similar probably to the ivy growing on a marble house, as each little tendril feels its way along it secretes a liquid which roughens the surface sufficiently to furnish a hold, so the tartar roughens, not by secretion, but by its own action, just sufficiently for a firm retention. This roughening process points to decay (if not perfectly polished after the removal of the deposit), and in the tartar itself we find bacteria, which would readily avail themselves of any contributing cause of decay. The salts found most abundantly in tartar are calcium carbonate ($CaCO_3$) and calcium phosphate ($Ca_3(PO_4)_2$).

What the laity generally consider as akin to tartar is the green stain, found more often on the deciduous teeth. This deposit is generally the result of cromogenic bacilli operating upon the remnants of the enamel follicle, which envelopes the tooth before eruption, and part of which persisted. This condition may be found in mouths which are not hygienic, but is also found in children of poor vitality.

In the affection of the teeth known as erosion we find the results of a chemical action. This erosion generally appears in situations which do away entirely with any idea of fermentation from food lodgment; from the action on the enamel we come to the conclusion that the active agent must be an acid, and in the anterior teeth we may look for the production of this acid in the mucous glands of the lips. Occurring as it does, mostly in persons of a gouty or rheumatic tendency, we conclude that instead of the secretion of the labial glands being alkaline, as it normally should be, it has, from the influence of the excess of uric acid in the system, become vitiated and distinctly acid in character; and from the constant washing of the enamel in this acid medium, it gives away under the influence, and little by little erosion occurs. The cause of the acidity of the secretion of the labial follicles is

the improper oxidation in the cells; the result of either the presence of less oxygen in the body, owing to the paucity in the number of red corpuscles in the blood of individuals showing a uric acid diathesis, or the use of more oxygen by the effort to oxidize all the material of which the body rightly should rid itself.

In caries, which is at once the arch enemy and the benefactor of the dental profession, we find a succession of chemical changes. In decay three conditions are necessary; moisture; the presence of a ferment; and a favorable temperature, the most suitable being between 25 and 40 degrees C. While decay, a putrefaction, may take place at a somewhat higher or lower degree under varying conditions, it cannot possibly occur below freezing or above boiling point.

Let us look at the chemical composition of the structures which are the prey of decay. Enamel contains of water and organic matter less than 4 per cent; its chief bulk consists of calcium phosphate $Ca_3 (PO_4)_2$, while magnesium phosphate ($Mg_3(PO_4)_2$), calcium carbonate ($Ca\ CO_3$), and traces of calcium fluorid ($Ca\ F_2$) are also present. Enamel is fibrous, having a cleavage in a definite direction, and would appear to be homogenous, but is not so, for acids act with greater rapidity on central portions, leaving the peripheral walls standing. Dilute hydrochloric and lactic acid, both act readily on the enamel structure, hence the influence of acid conditions of the oral secretions and of decay.

Dentin is also largely made up of calcium phosphate, other constituents being calcium carbonate, magnesium phosphate, certain soluble salts, chiefly sodium chlorid, fats and water. As one authority expresses it, about 62 per cent of the dentin is inorganic salts, 28 per cent tooth cartilage and 10 per cent water. Cementum is of practically the same composition as bone, containing of inorganic matter about 70 per cent and 30 per cent of organic. These are the structures upon which the bacilli of caries operate.

The progress of caries is influenced to a large degree by the character of the tooth tissues. If the molecules of the enamel and dentin are of loose composition, that is, if the union between the different chemical constituents is unstable, we may expect caries to progress rapidly, while if the chemical union approximates perfection, we may expect the structure to withstand the ravages of

the disease. However, the predisposing causes may be almost nil in the tooth itself; while extraneous causes may be so overwhelming as to overcome all the good to be gained from the former under different conditions, for in the influence of caries we must take into consideration tooth-structure in its actual chemical composition (whether calcium salts be below, at or above the needed per cent), the density or porosity in the stratæ of calcification, the systemic condition of the individual, the oral conditions, and the proper use or abuse of the teeth, adding to all these their proper treatment during disease.

An old theory concerning decay was that it was due to the action of three acids; if black sulphuric acid was responsible; if white nitric acid was looked to as the cause, and if yellow or brown hydrochloric acid was supposed to be the active agent.

The presence of the acids was accounted for in this way: The sulphuric acid was the result of the hydrogen sulphid found in the mouth as the result of putrefactive changes; the sulphur, acted upon by oxygen combines with oxygen to form sulphur dioxid, which in solution in the saliva becomes sulphuric acid. "Hydrochloric acid," according to an authority quoted, "may be free in the mouth, or may result from the decomposition of chlorids." Nitric acid was held to be the result of ammonia, also formed in decomposition; this was acted upon by oxygen and nitric acid was one of the products formed.

In one day we claim that decay is the result of decomposition, caused and aided by certain bacteria always in the presence of an acid, which can be proven by introducing litmus paper into a cavity of decay, the contents of which have not been disturbed in any way, or come into contact with any kind of antiseptic, and the blue will at once change into a decided red. The steps in the process of disintegration are as follows: Food lodges in sulci, or the interstices of teeth, ferments, heat is evolved, the bacteria already present in the mouth find lodgment, multiply, secrete an acid in which the mineral salts of the enamel are dissolved; the enamel is attacked at a weak point, an entrance gained, more bacteria are produced in the microscopic cavity, more acid secreted, more enamel dissolved, until the dentin is reached; this being richer in organic matter than the enamel covering it yields more

readily to the action of the bacteria and the attendant acid, decomposition of the structure occurs and we soon have a large cavity of decay, containing a mass thoroughly impregnated with bacteria and the ill-smelling gases of decomposition. It is to prevent further ravages of a similar character that we use antiseptics before filling; these substances having the power of preventing fermentation or putrefaction if of sufficent strength, or, if weaker, at least of retarding it. The essential oils are especially good for this purpose, as they seem to deposit a sort of film, which persists after the actual drug is absorbed, while other antiseptics are more transient in their action.

If this state of decay persists, the pulp is attacked; being composed almost entirely of organic matter, it quickly breaks up into the derivatives of decomposition, and if there be not sufficient exit for the gases through the cavity of decay, they force their way through the apical foramen, in all likelihood carrying with them some of the results of putrefaction; there on the apical space they act as an active irritant; if the irritation be not counteracted inflammation ensues, a chemical change occurs in the walls of the blood vessels, the white corpuscles escape, with them going a liquid by which the surrounding tissues are broken down and pus is formed.

Of pus we have different varieties; healthy or laudable, which is of a yellowish tint and possesses a peculiarly sweet taste, this being the common discharge; corrosive or unhealthy, which is noxious both to sight and smell, and indicates systemic complications; sanguineous or bloody, which may or may not be tending to health; and thin or watery pus, possessed of a distinctly disagreeable odor.

Laudable pus has no odor, is coagulated by heat, alcohol and acids, and when analyzed yields albumen and water, some sodium chlorid, calcium phosphate and other salts. The sodium chlorid found in pus is three times as much as that normally found in the blood.

While a chemical change takes place in the formation of the pulp, as the result of decay or by septic matter carried to the pulp by the circulation, another change may occur, either naturally or by artificial means. Artificially it is the result of the so-called

mummifying pastes; in the body itself it may be influenced by any irritant. In the process the water is expelled from the pulp, which changes from a soft, pinkish, living body to a dry, shriveled, dead mass, which, as long as moisture is excluded, is not capable of putrefaction.

After the tooth is made thoroughly aseptic and all traces of decay removed (except, of course, it being legitimate to leave a layer of thoroughly sterilized decay to directly protect the pulp in the hope of nature forming secondary dentin); after the tooth is fully prepared some filling material is inserted. In the use of gold, while the operation seems to be largely mechanical, nevertheless chemistry has its influence, for we anneal the gold "to make it soft and improve its working powers;" which process really consists of transferring a greater amount of energy to the molecules of which the gold is composed, of putting them in motion, driving them apart from each other, so when each piece of the material is driven into the cavity the particles are more ready to cling to one another, cohesion is more perfect, and we have, if the annealing and manipulation of the metal is performed skilfully, a solid homogeneous mass.

In the use of amalgam, we have an actual change in the form of the substances used. The term amalgam presupposes the presence of mercury. In the dental amalgam, then, we have a solution of silver, tin, zinc, traces of gold or platinum, and maybe copper, in mercury; the result is a soft mass, partaking of the exact character of none of its constituents, which lends itself readily to adaptation in any cavity, and crystallizes, forming a more or less dense mass. The fluidity of amalgam is dependent upon an excess of mercury, for if only sufficient mercury be used to combine with the alloy, fluidity is not a characteristic of the mass.

The different alloys are influenced by the metals used. In an amalgam made of an alloy in which tin is used in a reasonable per cent, the amalgam will mix more readily and set quicker; if zinc predominates there is danger of galvanic action; in legitimate quantities this metal controls shrinkage; copper is said to exert an antispetic influence. In the use of amalgam great care should be taken to have the cavity thoroughly dry, as moisture assists in the discoloration of the tooth-structure. The discoloration of teeth

which have been filled with amalgam is due to compounds of sulphur or oxygen; either of these elements acting upon the amalgam would form a dark salt or compound, either the black sulphid, or the oxid of silver, or the mercurial salts, the dentin being stained and presenting an unsightly appearance. In bleaching the tooth to do away with the stain the result is gained by the oxygen of the hydrogen or sodium dioxid combining with the hydrogen of the salt; this breaks up the union between the metal and its base, the former is set free and readily washed away.

It is the fact that H_2O_2 holds an unstable atom of oxygen, always on the alert for an affinity, seeking some other atom with which to combine, which makes the preparation such a valuable one as a bleaching agent.

In the use of cement the process is distinctly a chemical one. Zinc oxid is triturated with a small portion of phosphoric acid. The zinc of the oxid combines with the negative radical of the acid, and in proper quantities zinc phosphate would be formed, but since in the mixture used dentally there is too large a portion of the oxid to enter into a full combination with the acid, we have a mixture of zinc oxid and zinc phosphate in our cement. The cause of dental cement not resisting wear as long as the other fillings is its ready solubility in nearly all acids, being particularly influenced by lactic acid, which is found in nearly every mouth.

In the use of antidotes the action is also chemical. In the use of starch as a decolorizing agent for iodin we have the following: The iodin and starch combine to form what is known as iodized starch, an unstable compound, dark blue in color and soluble in cold water; this solubility allowing the stain to be quickly washed away. When alcohol is applied to counteract the effects of phenol, one of the phenol series is produced; and in the use of common salt to overcome the effect of silver nitrate we have an exchange of partners, silver nitrate giving up its metal to the chlorin and taking the sodium instead.

In the administration of gas, the peculiar pallor accompanying the anesthesia is produced by the action of the nitrous oxid on the circulation, for the blood during the exhibition of the drug is deprived of a portion of its oxygen.

In the use of litmus paper to determine the acidity or alkalinity

of a fluid, we make use of what is chemically known as an "indicator." The litmus paper is prepared by extracting the red coloring matter from powdered litmus in boiling alcohol. The residue is heated first with an equal amount of cold water to dissipate the excess of alkali, then with boiling water, after which it is filtered; unsized white paper is now dipped into this solution, and we have the blue litmus paper, and the red is made by treating the blue with just enough hydrochloric acid to give a distinctly red tint. Naturally if this red litmus paper be used, an alkaline saliva will quickly restore its original hue; while the blue product, sensitive to the slightest trace of acid, will readily indicate any tendency to an acid condition.

In vulcanizing, chemistry is again responsible for the change which occurs in the rubber from soft to hard. Dental rubber is pure rubber mixed with sulphur, or some of its compounds, and coloring matter. For a long time it was thought that steam was responsible for the change in form, but since it was found that the rubber hardened under dry heat, too, the whole cause was sought elsewhere, and it was determined that the real reason of the hardening process lay in expelling the hydrogen from the rubber under influence of heat, this hydrogen combining with the sulphur in the mixture and forming hydrogen sulphid, the presence of which can be always detected while vulcanizing. The process is chemically the same as that taking place in the earth when vegetable matter is changed into coal, the only difference being in the time taken. Porous plates are caused by too quick heating, by which the outer surface of the plate is hardened before the inner; the gas from the inner surface, seeking an exit, and possessing the power of expansion under heat, forces its way through the unhardened mass as far as it can possibly go, making cavities all through its substance.

So, if time permitted, we could continue ad libitum to illustrate the presence of chemistry in every branch of science, in every walk of life, at all times and places. One of the latest achievements in which it has been an important factor is the study of the human brain, so that the scientist can tell the man, his characteristics, his capabilities, the probable influence he exerted on his fellow workers. Could the delicate, soft, yielding tissues of the

brain be handled without displacement? Had the mass not first been treated with some suitable chemical that would change neither its form nor its weight?

The whole world relies on this science. Today there is not one atom more or less in this great universe than when Adam walked lonely and supreme in the beautiful garden. It is like the lines in Shelley's beautiful poem:

"I am the daughter of earth and the water,
The nursling of the sky;
I pass thro' the pores of the ocean and shores,
I change but I cannot die."

When we "destroy" anything not a particle is lost, for could all the gases given off, and the residue, be weighed, we would have exactly the weight of the original substance.

One beautiful influence of chemistry is shown in a recent report of the forestry commission, which came as a distinct surprise to many. The statement was made that unless wholesale lumbering operations were halted, many now flourishing hamlets and villages in the West would in a few years be desolate wastes. Why? was the first answering thought. Did the people do nothing but lumbering, and could they get no other occupation without leaving their homes? This was far from the reason of the coming desolation, which would be wrought by the need of water—*water,* the substance without which man is powerless to live—for the great forest, like other living tissue, must have abundance of water to grow, and they hold, storing up like living fountains in their roots, their trunks, their branches and stems, water, which, when the mighty monarchs of the forest are torn up, passes away with them, and a country that has been covered with forest, and plentifully supplied with water, will either notice a great decrease in the water supply on the removal of the forest, or it will disappear altogether.

What an inexhaustible mine of riches this chemistry is! and yet how few there are who can see its influence in their daily life. It seems to me that if each of us were trained from childhood up to think of everything that happens as dependent upon some chemical

or physical law, it would lend an added interest and pleasure to our lives, and surely give us a deeper appreciation of nature.

SOMETHING ABOUT PRESSURE ANESTHESIA AND DIFFICULTIES ENCOUNTERED.

BY R. B. TULLER, D.D.S., CHICAGO.

There are many cases where the living pulp of a tooth must be promptly eliminated; but, without the use of anesthetics of some kind, it involves heroics that would try a Spartan. Gas is sometimes administered, but ordinarily it does not last long enough to give any satisfaction if the case is at all complicated, as it usually is, requiring most careful and deliberate action, and involving often a good deal of time. If a tooth has more than one root the removal of all the pulp with its root extensions is more or less complicated, even if conditions are normal. Rarely do we succeed in getting the entire pulp from two roots in two movements or efforts; therefore an anesthetic must be used that has a somewhat prolonged action.

An anesthetic may be injected into the gums as for extraction, and it may be far-reaching enough to paralyze the pulp; but that method has the same objections that obtain in using it for extraction, which it is needless to discuss here. It might be resorted to in an emergency, or when one fails in the pressure method from any cause.

Those who are familiar with so-called pressure anesthesia naturally turn to that method when it is desired to put a living sensitive pulp out of commission. In its early use it was applied only in some cavity of decay and in cases of exposure or very close to it. The writer was unquestionably the first to use a specially made opening into healthy dentin and to make public the process through dental journals. Since then it has been found in many instances more convenient and quicker and more advisable to use this specially made opening than to open up the cavity of decay so that it may be consistently utilized.

Since this special opening through the enamel was made public a number of special instruments have been devised and put on the market to introduce the cocain solution into such opening

under high pressure; but it has been demonstrated over and over by the writer, also by the late Prof. W. D. Miller in a series of experiments undertaken before his death, that such high pressure is not necessary and may be dangerous in forcing the cocain hydrochlorid beyond the territory in which it is needed and useful, and leading to deleterious sequences in causing tenderness, if not severe soreness, more or less prolonged, at the end of roots of the teeth involved. In numerous cases fillings inserted at the time of removing the pulp have had to be removed, as well as root-fillings and roots treated for some time, for this stubborn soreness before fillings could be replaced. This may happen if too much force is applied in any way, as in putting the solution in the chamber or roots of teeth to insure anesthesia to the apex and exerting too much pressure. The solution ought never to pass beyond the apex of a root. While it is not possible to always prevent this, the minimum of danger lies with simple hand pressure.

Special instruments of any kind, though often a great convenience perhaps, are not necessary to press cocain solutions into a tooth either in the cavity of decay or the specially made opening. If the medicament can be *confined* under pressure so it cannot escape, hand pressure will send it into any dentin or any exposed pulp if conditions are normal. The conditions that mostly antagonize or forestall the pressure method are largely deposits of secondary dentin within the pulp chamber, and it has been found that cases that obstinately resist the pressure method are equally persistent in resisting the action of arsenic trioxid. It took pressure anesthesia to tell us why it was that some teeth were so much longer than others in responding to the action of arsenic trioxid. The writer has in a number of instances failed in using the cocain hydrochlorid under pressure, and was compelled to resort to the old arsenical method, with the result that a forty-eight-hour application of the latter seemed to have got no nearer the goal; and with little effect in subsequent applications. Eventually when the chamber was entered, calcic deposit was found to be the obstructing cause.

This secondary deposit has various ways of locating itself in the pulp chamber and canals. In some instances it attaches to

and thickens the wall of a pulp chamber. Not being regularly organized dentin, it is without the tubular system of primary dentin, and in fact it clogs the tubules of ordinary dentin, thus making it difficult or perhaps impossible to force cocain solutions through it to the pulp. Of course with an exposure of the pulp in such a tooth, and applying the solution, confined, to exposure, results ought to be obtained with little difficulty; but another form of deposit occurs not infrequently where the pulp has absorbed it all and turned into bone entire, or a goodly portion of it. This class of deposit lies in the chamber free from attachment to the cavity and root walls; and thus it is possible sometimes to remove the calcified contents of a root complete and intact with a bit of live, sensitive pulp dangling at the end, resembling a diminutive whip with a short lash. It is in these ossified pulps that we get little or no response to cocain hydrochlorid under pressure, and arsenic trioxid as well. It is, of course, difficult to diagnose the condition; hence all efforts in the pulp chamber or through a special opening are of little or no value, and it is then the operator might turn to gum injection.

A deposit of pulpstones in the body of the pulp causes some hindrance to the action of both cocain hydrochlorid and arsenic trioxid, but not so much as the other two described. In passing, it is pertinent to say that any one of these forms of calcic deposits in the chamber and canals may be the cause of the most severe and persistent neuralgia while the tooth may be otherwise sound. The writer about thirty years ago extracted two lower first molars at different times for a strong, healthy man, that were driving him to distraction. Both teeth, externally considered, were as sound and strong as could possibly be, and extraction was at first refused. Both of these teeth when split open dropped out absolutely solid, calcified pulps. About them was a little serum, but they fitted their places like nutmeats. These are, as was said, some of the causes of obscure and horribly severe neuralgia. Today before resorting to extraction our diagnosis would take us into the interior of the tooth to see what might be brought to light there; but success with pressure anesthesia would hardly result in such a tooth.

Now, to apply pressure anesthesia through the made opening

or otherwise, and without any special instrument or syringe, follow these instructions: Bore a hole with a small bur through the enamel at some convenient point, preferably at neck of tooth. With a bit of cotton fill the hole loosely, and then saturate the cotton with the cocain solution; keep protected from saliva. Now stick a small ball of guttapercha on the broad flat face of an amalgam plugger and, warming *just a trifle,* push it down over the hole as hard as you can. After a moment the hole may be drilled deeper, and if sensitivity is reached the operation may be repeated as often as necessary.

On reaching the pulp an exploration will quickly determine whether it is numb all through or not; if not, the same modus operandi may be repeated, carrying the anesthesia as much further as required.

In the hands of the writer, and a good many others, pressure anesthesia is looked upon, in many instances, as a godsend to both patient and dentist. The cocain solution is easily made as wanted by putting a drop of adrenalin chlorid or solution adrenaphin on the slab and putting a few crystals of cocain hydrochlorid into it. An exact strength or combination is not required as would be the case if hypodermically injected in the soft tissues, as in the tooth it does not get into the general circulation as in hypodermic injection. Practically it is limited to the pulp, and the pulp is immediately taken out.

Of course it goes without saying that any special openings made should be carefully filled. This may often be done by using a bit of gold wire of the same size or a trifle longer, so that when tapered slightly a close fit is acquired. Cement is first introduced and then the wire tapped to place. Any protruding portion should be ground flush and polished.

Sometimes this special opening may be made near the cavity to be filled in such a location that the natural extension of the cavity will take it in. Thus, when a cavity is in a proximal surface of a molar, for instance, the special opening may be made occlusally in the line of extension to gain occlusal anchorage.

HYPEREMIA.

BY J. F. BINNIE, M. D., KANSAS CITY, MO. READ IN THE SECTION ON SURGERY AND ANATOMY OF THE AMERICAN MEDICAL ASSOCIATION, AT CHICAGO, JUNE, 1908, AND REPRINTED BY COURTESY OF THE JOURNAL OF THE ASSOCIATION.

When some noxious influence acts on a more or less limited area of the body, local resistance is manifested by the production of granulation tissue and of hyperemia. Under favorable circumstances the granulation tissue repairs defects resulting from the noxa or more or less completely encapsulates the irritating agent. Under less favorable circumstances the irritation being continuous, e. g., in tuberculous infection, granulomata are formed, these granulomata being evidence of defence. If the resisting power is sufficient the embryonic tissue overcomes the irritant and encloses it in fully developed scar tissue. Stimulation of the production of granulation tissue in and around a tuberculous focus seems to be the therapeutic action of injections of emulsions containing iodoform, bismuth, finely divided carbon, etc., and of sclerogenic injections.

The second method by which Nature resists a noxa is by hyperemia. When an irritant, e. g., the staphylococcus, gains access to the tissues the flow of blood to the part becomes increased, there is exudation of fluids and leucocytes from the vessels into the tissues. The blood serum contains antibodies or antitoxins which neutralize the chemical products of bacterial activity, bacteircidal agents which attack the bacteria themselves; opsonins which prepare the bacteria for absorption and destruction by phagocytes or perhaps act as a sort of appetizer or cocktail to the phagocytes, and lastly there are the leucocytes which act as phagocytes directly killing bacteria or as scavengers removing the debris of the fight. Thus while the granulation tissue acts as a sort of passive role besieging the invading irritant, the hyperemia directly and actively combats it.

It was noticed long ago that valvular disease of the heart causing pulmonary congestion seems to prevent the development of pulmonary tuberculosis. Bier, struck by this observation, thought

that by producing local hyperemia he could modify or cure tuberculous lesions in various parts of the body. He produced the necessary congestion by applying a rubber bandage proximal to the lesion—in a limb. Only sufficient constriction was used to produce a warm swelling. The constriction must never be severe enough to cause coldness, pain or even paresthesia. The results obtained in tuberculous lesions led Bier to extend the treatment to various other infective lesions in which the results have been most gratifying. Klapp, who is associated with Bier, thought that the same results might be more conveniently obtained by the use of cupping glasses of suitable shapes and sizes. It is with this last method that I have had most experience, and I have come to have much faith in it.

Method of Use.—If pus is present it is evacuated through a comparatively small cut or puncture. The suction of the cupping glass will notably aid in the removal of the pus. A suitable cup which completely covers the lesion is applied. Suction is produced by means of a rubber bulb or a syringe. The suction must be strong enough to produce a red swelling of the part. If the swelling becomes blue the suction is too powerful. The same is true if pain or paresthesia is occasioned. The suction is kept up for five minutes, the cup is removed for three minutes, and reapplied for five minutes, etc. This alternation of five minutes of suction and three minutes of rest is persisted in for about forty-five minutes daily. The patients quickly learn the correct degree of suction to apply and soon can carry out the treatment better than can the surgeon. The suction exerted brings an increased quantity of blood into the part and increases the exudation from the vessels; thus an unusual amount of the active protective material is brought into the place where it will do most good. The suction must be sufficiently strong to produce this condition but not strong enough to cause stasis of the blood in the part. There must be an increased inflow and only a slight decrease outflow of blood in order that the maximum amount of the active fighting forces may be present during the whole period of suction. The periods of rest permit the escape of blood from the part, and thus when the suction is once more applied an entirely fresh supply of fighting material is obtained. Wright believes the escaping

blood contains a vaccine which stimulates the production of antibodies throughout the economy.

In our student days we were taught that pain in an inflammatory lesion is due to mechanical tension or distention, i. e., it is due chiefly to the swelling. The injection of water into the skin produces a temporary pain—later anesthesia. The increased swelling occasioned by the proper production of hyperemia is followed by a notable and early decrease in pain. Pain in an inflammatory lesion seems to be due to irritation by toxins and especially to the high specific gravity of the inflammatory exudates. Hyperemia properly produced destroys or dilutes the toxins and dilutes the exudates. Everyone knows the relief experienced when a tense inflammatory swelling is incised, i. e., when tension is relieved.

The tense swelling is due to an exudate of high specific gravity —the tension prevents the inflow of blood to the part and the escape of diluting serums from the vessels and when the tension is removed fresh blood flows into the part and relief is obtained.

C. Ritter has proved that the freezing point of pus is always lower, sometimes very much lower, than that of blood or serum, which are alike. The pus of a cold abscess has a freezing point, that is, a concentration, almost identical with blood and serum. Inflammatory serum has a freezing point similar to that of pus. It is safe to say that the fluids of inflamed tissues are of higher concentration than those of normal. If these experiments and observations are true, then any treatment which tends to dilute the fluids of high specific gravity and bring them to a concentration equal to that of the blood and blood serum must relieve pain. Relief of pain is one of the marked features of the treatment by hyperemia.

In dispensary practice I have learned to trust to treatment by means of cupping glasses in those forms of cervical adenitis so common among the poor. If pus is present it is evacuated through a tenotome puncture and suction applied; if pus is not present cups are applied at once. Usually cure results in seven, eight or ten days and scar is notable from its absence. A most striking result was obtained in the following case:

Patient.—A farmer, aged 37, suffered from a large bunch of glands of wood-like hardness situated behind the sterno-mastoid near the clavicle.

This adenitis was secondary to boils on the back of the neck which had healed. There was intense pain, preventing sleep.

Treatment.—Suction hyperemia was instituted, and after two treatments the patient could sleep well and was comfortable. After four treatments all the periadenitis had disappeared, the glands, decreased in size, were mobile and discreet. Complete recovery was prompt. Even after the first treatment the patient maintained that he felt distinct relief.

Another illustrative case was the following:

Patient.—W. J., aged 45, on February 8, 1907, punctured his palm with a nail. In about two days there was much pain, etc., and poultices were applied.

Treatment.—On February 12, the hand was much swollen, both in the back and in the palm; great pain and tenderness were also present. Fingers were stiff. A small incision made in the palm (¾ in.) showed pus deeply seated; it was squeezed out. Suction hyperemia was applied by the patient about three times daily for 30 minutes at a time.

Result.—February 19: There was no pus, no pain. Fingers were mobile, though stiffer than normal. Swelling was almost gone. The pain was the first symptom to disappear.

I have seen a goodly number of buboes disappear promptly and with the minimum of trouble after the contents were evacuated through a puncture and hyperemia was produced by suitable cups. In the treatment of furuncles the cupping glass often acts like a charm and the abortion of boils is common.

I have thought it worth while to give a short description of the simplest possible treatment of some common and troublesome ailments because the simplicity and apparent futility of the treatment is calculated to keep many from employing it, but simple as the method is it has proved its worth not merely in the rather trivial ailments I have spoken of in this paper but in many serious lesions.

Discussion.—*Dr. M. G. Seelig,* St. Louis, said that for three years he has made use of Bier's hyperemia both in dispensary and in private practice with good results. The patients, as a rule, have been spared not only the pain that goes with the infection, but the pain that goes with the dressing of all very painful wounds. In all these three years he has never used anything in the shape of a drain. In common with Dr. Binnie's experience he has limited himself almost exclusively to the cupping treatment of Bier, and based on that experience he has gradually grown more and more to believe that the pure mechanical evacuation action of the cup

is of almost as much importance as the physiologic action. His results with the tourniquet have not been so good. In using the Bier cup you increase the pressure for a few minutes; with the tourniquet there is more or less danger of causing anemia rather than hyperemia.

The phase of Bier's hyperemia that always appeals most to him, and which for some reason is not emphasized in the literature, is the portion embraced in Bier's preface in his original work, in which he emphasized the philosophic principles back of hyperemia. He considered that inflammation is a series of phenomena set up by Nature in an attempt to cure itself, and that it lies within the province of the doctor not to regard inflammation a witch or devil invading the human organism. This is important from a historical point of view, and if we go back a few years we find that Bier is merely upholding a doctrine which the celebrated John Hunter fought for.

Dr. Victor J. Baccus, Chicago, said that he did not believe in the treatment of Bier before he went to Berlin, although he had read everything that was written on the subject, and had tried it on half a dozen patients. After he got over there, he found that he did not know how to use the method and that was why he had not been more successful. The ward cases soon convinced him of the value of the method. He saw cases of cellulitis of the hand, not limited to the fingers, but infections involving the hand and extending up to the elbow, so that any surgeon would have applied a hot dressing and opened the hand the next day. The patient was put to bed and constriction was applied. The period of physiologic rest, according to Bier, had passed away, and in five or six days the constriction hyperemia caused the inflammation to decrease, and then the patient was encouraged to move the fingers. The object is to heal the part without mutilation, keeping the tendons functionating. If the inflammation is localized and there is danger of softening and necrosis, incisions are made in the skin, with or without local anesthesia, followed by cupping. Such hands heal in from two to three weeks and the patient is well. The bad results arising from the use of this method are due to faulty technic. With reference to the apparatus necessary, it is simply a rubber band, one or two cups and a hot air bottle,

which anyone can make for himself, the whole outfit costing not more than four or five dollars. Trust to the rubber band, use it according to instructions, and you will get results.

Dr. D. N. Eisendrath, Chicago, said he had tried this method of treatment by means of the constricting band and the cup at the Michael Reese and Cook County hospitals in hundreds of cases, and had come to certain conclusions. He has found that in the acute arthritis, the acute pyemic arthritis or gonorrheal arthritis, there is no better treatment than Bier's hyperemia by means of the constricting band placed proximally to the joint for two hours a day. It gives almost immediate relief from the pain. In tuberculous arthritis his results have been almost equally as good. It is remarkable how much can be saved in the way of operative treatment by a systematic and persevering application of this treatment. In regard to certain varieties of infections he would like to have Dr. Binnie's opinion. In cases of acute streptococcus infections, those which travel rapidly up the arm or leg, he has found that the Bier treatment has but little effect, so that he has practically given it up and resorted to older methods of free incisions and hot applications and dressings. He has also found the method very useful in promoting union of fractured bones and also in preventing infection; for instance, in crushing injuries of the hand, when he has tried to save fingers, he often is in the habit of putting on constriction to prevent infection, and in many cases it has been of the greatest possible advantage. He thinks that the profession does not sufficiently appreciate the value of this treatment. If the treatment were applied only to certain cases and not to others, it would be more widely adopted because of the better results that would be obtained.

Dr. John B. Murphy, Chicago, said that there is nothing that he knows of that has come into surgery in the last ten years as a practical application that appears to him to have as much value, and, he is sorry to say, is practiced so little and is so frequently misused. He believes that its most important place is in the acute infections. Take, for instance, the crushing injuries of the hand, the infected wounds of the hand that produce such disastrous results, often leaving the hand a crippled member for the remaining portion of the patient's life. He believes that a very great ma-

jority of these cases can be aborted as simple infections of the finger or even the thumb with a properly applied constricting band or cup. Which should be used is a matter of convenience, but the aim should be to accomplish a definite purpose; to have a definite object in view. We have been talking about dispersing inflammation. Our forefathers poulticed hoping to scatter the infection. Everyone now knows that that very infiltration is Nature's effort at holding in, circumscribing, retaining and overpowering the zone of infection. Anything that aids and strengthens, that by increasing the edema, increasing the swelling, increasing the circumscribing power of the tissue in that part aids in the process of preventing the spreading of the infection. If you will bear in mind that the purpose of the Bier treatment is—never mind the theory—to hold and circumscribe that infection, and if you produce edema by means of constriction or cup, you will find that your patient is relieved of pain. It is better than a poultice, the coffer-damming is more complete than with a poultice, and you curtail the time that is consumed in repair. Dr. Murphy said that if he were in emergency practice he would dispense with every dressing on a wound. After it has healed put on a cage of wire to prevent contact and use the Bier treatment to promote local resistance against infection that is present or may be imminent.

Cast Coping for Bandless Porcelain Face Crown.—Prepare the root as for Richmond, only the enamel need not be removed from the periphery, prepare your pin of platinum or platinoid of proper length to extend a couple of millimeters beyond face of root.

Warm a small piece of carving wax, such as you use for your cast inlays, and press over face end of root, imbedding end of pin in same. Cool with water from your syringe, and remove. The pin comes off with the wax cope; invest pin and wax cope in your metal ring and proceed as with an inlay. There is a slight overlap at the margin; this may be trimmed before the wax cope and pin are removed from the root, but it can be accomplished easier after the coping has been cast to the pin, as the imprint of the margin is left in the wax.

If you will try this method, you will find that you have a perfectly fitting cope.—H. F. Best, *Dental Summary.*

Digests.

PRINCIPLES OF CAST GOLD INLAYS. By W. H. Taggart, D.D.S., Chicago, Ill. It has been, for a great many years, an established fact that the inlay principle of saving teeth is a good one. Even with all the crude methods and imperfect workmanship that went with it, we found that we were saving teeth by the inlay method. Why, then, can we save teeth by the inlay method better than with the cohesive gold foil method? I will tell you my theory, and if it is not considered sound, you can combat it in your discussion. It is this: A tooth of good quality is easily enough saved by any method. If a man accidently bites on a piece of soft solder that happens to be taken into his mouth in his stewed tomatoes, having slipped in with the other contents of the tomato can, and drives it into a cavity in the grinding surface of a molar tooth, the oxidization connected with that, together with the fact that the tooth does not need saving very badly, will oftentimes make that as perfect a filling as any dentist can make, so far as saving that tooth from further decay is concerned, for the reason that the tooth is of such perfect material that it is not very susceptible to decay, and therefore all that is needed is almost any sort of substance with which to plug up the hole and keep out deleterious substances. That class of cavities and that class of teeth we will have to eliminate in our discussion of this subject, and we will take up the consideration of teeth of low grade which need constant care and attention to prevent the occurrence and recurrence of decay—what we call "soft teeth." Dr. Black says that all teeth are of the same chemical constituents; at the same time clinical experience shows us we have what are known as hard and soft teeth. In the latter class we find teeth in which when we prepare them for a filling and get what we think are well defined enamel margins, we still find that the enamel chisel can go on and cut and cut. The patient is constitutionally frail and anemic, the teeth are of low calibre. We try to pound the cohesive gold into a tooth of that quality, and you find that the pericementum surrounding that tooth is not strong enough to stand the continuous strain of the constant battering against it, and when the filling is in place and beautifully polished, in the

course of a year, at the outside, you will see a blue margin coming around the filling, and later on the whole filling will look as though it had been dipped in ink.

The reason for that is that capillary attraction has taken place between the walls of the cavity and the filling. We know that there can be no contact of one hard substance with another but that some space, microscopic though it may be, is left between them. Between the metal filling and the structure of the tooth there is always a possibility of capillary attraction, and the narrower the space and the finer the line of contact between them in a tooth of low calibre this capillary attraction extends the deeper. This is well illustrated by the familiar laboratory experiment of the glass tubes of calibers ranging from an eighth of an inch down to the size of a hair, which, when immersed in a vessel containing a colored fluid, you can note the varying height to which the fluid rises in the tubes above the level of the fluid in the vessel, being much higher in the smaller tubes. For that reason, in a well condensed filling in a tooth of low grade, when surrounded by the fluids of the mouth, this capillary attraction takes place and the fluid finds entrance.

The reason why this does not occur in the case of the inlay is this: The inlay may not fit the walls of the cavity as closely as the cohesive gold filling, but the fact that there is a film of cement between the inlay and the walls cuts off this capillary attraction, consequently that tooth is saved by the very thing that formerly made it draw the fluids of the mouth in back of the filling.

Someone may say that the cement is of only a temporary nature and that it is the weak part of inlay work. Gentlemen, the cement is the stronger part of the inlay present. Without it we could not save these teeth, no matter how well the inlay is made to fit the cavity. If we did not have the help that comes from the cement, we could never save a tooth by means of an inlay.

Now cement has its good qualities. If the cavity is properly prepared, there is not a gentleman in this room who has ever seen a tooth decay under a cement filling. The cement may be washed out and the gingival margin exposed, the decay taking place in that direction, but underneath that cement you have never seen decay take place if the cavity was properly prepared; and if

it was improperly prepared, even then, oftentimes, the cement will save a tooth from any further decay.

In the inlay, the amount of dissolution of cement that takes place is in exact proportion to the width of the line of cement, and whatever the width of that line, whether it has the thickness of the thinnest piece of tissue paper or the thickness of writing paper, or the extreme thickness of a piece of blotting paper, it will only dissolve out of the width of that line.

We will take now a typical case of the proximal surface of a bicuspid. In that decay starts from the center of infection and progresses outward and it will finally decay forward until it comes to the line that we cut to when we adopt the principle of cutting in extension for prevention. But we have never seen the time when it would commence at that outward line and decay inward; so when we cut the tooth away and cut inward, we have taken this margin to an immune territory, and taken it to a position where it is not subject to inevitable decay. So I think that explains one of the phases why an inlay is able to save a tooth of low grade.

It has been said this principle of relegating dentistry to a purely mechanical proposition is taking away from the scientific side of our profession. A very interesting paper, written in the most beautiful language, was read last week before the Illinois State Dental Society at Springfield, having for its title, "The Science and Literature of Dentistry." In that the essayist sounded a keynote of warning in something about these words. He feared that the fact that we were making the saving of teeth a purely mechanical proposition—he was alluding to the principle of the inlay method of filling teeth—would take something away from the scientific possibilities of our profession. He said, in substance: Think what a simple proposition this inlay method is. All you have got there is your ability to melt the heated gold together, and see that those two surfaces are free from foreign substances.

Now, gentlemen, I think he was mistaken in that; because if there is any one proposition in the field of dentistry today that is permitting of the highest degree of scientific attainment, it is present in this inlay work. Just think, gentlemen, of the possibilities, not in the mere mechanical application of the inlay, but in experimenting and finding out how best to save the teeth. Before you

have gone very far into this work you will find there is a given temperature at which you can cast this inlay to get the best results. It means a great deal of scientific attainment and investigation. When it comes, it will require years of experience to attain it, and then some man can get up on a platform and tell you in five minutes how to do that.

There are scientific possibilities in ascertaining the proper kind of investment, the proper temperature in which to mold; the proper pressure in which to get the very best and most accurate results. Take the scientific side of knowing what we think now is a simple proposition, that is, the mixing of the investment. All those fields, gentlemen, are open and ripe to scientific investigation, and without that scientific investigation you have no right to go home and do nothing but fill teeth as someone else has told you. Get busy; try all these experiments and find that you can do things that you had never dreamed of before, if you put a little thought in it. Do not leave it all with one or two pioneers, men who are willing to work, and strive and struggle to improve the conditions. Remember that the scientific man is not working for glory, is not working for money, but he is working for your good and the good of humanity, and if you return home and slavishly follow instructions that you have heard at a dental convention, you are not living up to your full privilege as a professional man.

And there is another point in which science touches this question, in the casting of the inlay, which I have just discovered recently. We know that there is a certain amount of plaster of paris in the investment material, and in from twelve to twenty-four hours there is a vast change in the shape from the contraction and expansion of that plaster cast, and these chemical changes continue to go on for the full twenty-four to thirty-six hours. Now, we have been in the habit of mixing our investment and putting it around the wax—if it was finished we would cast it that same day; if not finished, we would cast it the next day. Now, all changes possible to take place in the plaster of paris are going on every hour of that time you are waiting. Now, the scientific side comes in and teaches you this: How to ascertain the time at which you can stop chemical change, and when is the best time to do your casting. That means you must pursue a great deal of experi-

menting and undertake a great deal of hard work. Now, I have found that the change in the shape of the small amount of plaster of paris in an investment will go on for twenty-four to thirty-six hours, and if allowed to go on for that period of time, there will be a change in the shape of the hole you are going to cast your gold into; consequently you are going to run your gold into a mold that is of wrong shape and it is not going to give you an exact reproduction of that cavity which you originally obtained in the wax; but by waiting only a few minutes, say ten minutes, until the plaster of paris or the investment has set and then commence to dry the moisture out that later on produces the crystallization and chemical change* in the material, and bringing about this distortion in the form of your matrix, you stop that chemical change right there and preserve the form of the mold which accurately represents the shape of your vavity. This is one scientific point, and there are hundreds of directions in which you can all follow this out and gain other advantages.

There is another advantage that is coming and that is this: The manufacturer of the investing material says it does not expand or contract. He does not make that claim for the purpose of deceiving, but purely in the matter of business, with a view of selling you something. What he means, right down in the bottom of his heart—"just us girls, talking here together"—is this: Under the influence of heat it will expand, but after it is brought back to a normal temperature again, it is of normal size. That is what the maker of an investment material should tell you, but he does not do it. He says flatly his investment material will not expand under the influence of heat. Gentlemen, it does expand under the influence of heat. If in burning out your wax you bring your investment flask up to a high temperature, the higher the temperature the more the investment material keeps expanding. What does that mean to you? If that investment expands, then the hole into which you are going to throw this gold must expand also and become a larger cavity than your wax represented or than the prepared cavity of the tooth itself represents. Consequently, when you pour your metal into the hot flask, you are casting into a false mold and one that is larger than the cavity you are intending to occupy with the inlay.

*The change is purely physical.—Ed. Digest.

Now, I want to say right here to you, that while I am in the market with a machine and investment and wax, I want you to cut the consideration of that all out. This is a scientific body and it has nothing to do with the commercial side of my machine. I consider it as a legitimate right to mention my machine, as part of the process all the way through, but not for any commercial advantage whatsover, and so, whenever I may allude to my machine, or my method of doing this work, please remember it is solely from the scientific and utilitarian side.

Now, the method of correcting this distortion of the investment through heat and the increase in the size of the matrix in which you wish to cast is this: By allowing the flask to cool down and bringing that investment back to a normal temperature again—back to the temperature of the room, or the body, where you can pick the flask up and hold it in your hand, then melt your gold, force it in there, and you are then casting into a normal-sized mold. This you cannot do if you are obliged to melt your gold with the ordinary sized blow-pipe, by means of a current of air, or with the gasoline blow-pipe, for the reason in melting your pellet of gold, as it lays in the crucible right over the mold, as you bring the flame onto that to get it up to a temperature at which it is fluid, your whole flask, and consequently your whole investment, is brought up to that red heat. With any ordinary machine, where the gold is melted with an ordinary blow-pipe, the flask is brought absolutely up to a red heat, or else your gold could not be melted, because the temperature at which gold melts is about the limit of heat you can get from the ordinary blow-pipe.

But alluding again to my particular process, I shall explain this as a part of it: The nitrous oxid is not a blast flame, it is a chemical flame, and the particular chemical advantage is, that the carbohydrate and acetic acid (?) are so thoroughly satisfied with oxygen that the combustion is complete, making a temperature that is intense enough to melt platinum. Now you can take 5 dwt. of gold in your crucible, and the intense heat will fuse that piece of gold so rapidly, bringing it to a boiling point so quickly that the temperature of the flask has not had time to rise and the consequent expansion of the material in the flask to ensue. In short, you can make a cast, with the nitrous oxid flame, lift the flask out and put

your hand on the opposite side of it, and there is no temperature there. In other words, the heat has not penetrated the investment and brought it up to an abnormal temperature, consequently you have forced your gold into an accurate mold. That, gentlemen, has everything to do with the success of your work. Now, you may say that you get good adaptation, better than you ever did, when you used the matrix process. Gentlemen, without those little, simple things, those underlying basic principles of the scientific side, and in ignoring those, you are not living up to your full privilege in the fitting of an inlay into a cavity.

There seems to me something about the process of melting gold and bringing it up to the boiling point, by which I mean several hundred degrees above the melting point, which is not fully appreciated. The ordinary blow-pipe is capable of bringing the temperature up to the melting point of gold, and beyond that it is pretty hard to go. But if you can carry it several hundred degrees higher than that, which can be done with the nitrous oxid blow-pipe, you bring it up to a more liquid condition, and thus the thinner it is, and for that reason you can force it into finer and sharper lines than you can possibly do if the gold is thick and slushy.

There seems to be an influence that is brought to bear upon gold under these conditions that has never been recognized in metallurgy. It has been taught in the books, and has been assumed by metallurgists, that the highest specific gravity that a piece of pure gold that has been melted and allowed to cool will attain is 19.16. There is something about this process of throwing the gold in this liquid condition into the mold, and when placed in the mold holding it there under pressure, that increases this specific gravity. In that case we are putting the gold into a different environment from that in which it was ever placed before. There has been no means of testing the specific gravity of gold under the conditions in which we now use it; for that reason I felt that the real fit of that filling must be because by my process I changed the molecular condition of that gold—changed it so that it was made more dense and with a higher specific gravity than the standard mentioned in the books. I therefore determined to make a test. I procured 10 dwt. of gold,

cut it in two, using 5 dwt. for each cast, then for fear that different sections of that piece of plate gold would possess different degrees of specific gravity; that is, in the melting and rolling of the gold plate some sections of it might be of purer quality and higher grade than others, although the entire plate was supposed to be 1.1000 fine, it being the gold that is used by the Williams people in making their gold foil, and is supposed to be as near to pure gold as it is possible to make, I took those half-sections of plate and cut them into smaller pieces, mixed them all up so as to eliminate any possibility of there being a difference in the specific gravity of those two pieces; I then melted one into a button and took it to one of the best metallurgists we have in the city of Chicago, a man of international reputation. He put it to the test and found that that pellet of gold, melted and allowed to cool in the atmosphere, without pressure on it, had a specific gravity of 19.16 or what he considered to be the ultimate density of pure gold. I then took the other section of the plate, which he had tested and found also to possess a specific gravity of 19.16, and cast that in this boiling, liquid condition with pressure back of it holding those molecules of gold in the matrix in which I had forced them. I said to those molecules of gold: "Here, you have been in the habit, when you cooled off, of assuming whatever position you chose; if you were in a certain position you would squirm around and get where you wanted to get; now, you must go where I want to put you." In forcing that gold in with the pressure back of it, I said to those molecules: "Go and stay where I put you," and those molecules obeyed, and this metallurgist made the test and found the specific gravity of the whole piece, including the excess gold, and the inlay proper, was 19.35; then I had him test the specific gravity of the inlay filling cast under pressure in the matrix, and that, gentlemen, was found to be 19.45, a density that gold was never recognized as assuming before, and the balance of the cast, consisting of the "sprue" and the excess gold, when tested alone gave a specific gravity of 19.27, showing that whatever change in density had taken place was in the sprue and not in the filling itself; in other words, that which was thrown in the cavity first and cooled first and which was held in there with pressure back of it, assumed

a specific gravity greater than that which had cooled off without interference later on.

Gentlemen, that shows us that we are using today in all these processes, whether by your process or mine, gold in a condition which no metallurgist in the world has used it before. They have never placed gold in the position we have placed it today. Now let us compare this density with the density which can be acquired in packing gold foil in a cavity.

Dr. McKellops packed gold harder than any man ever had been able to pack it heretofore, and he never succeeded in getting a higher specific gravity than 17. Darby and Espey of New York secured a density of but 16; Dr. Black dropped back to 12, and so on. So you will appreciate the fact that the density of the gold in the inlay is greater than has ever been used before in dentistry, and this is the very thing that keeps this filling from shrinking. Just as soon as you drop away from pure gold and go down the scale, you are securing a lower specific gravity in your piece of gold, and there will be more change in the shape of it, and consequently more shrinkage. So, I advise you to stick as closely as you can to 24-karat gold in your work. If under certain circumstances you desired a gold more stiff than 24-karat, to resist stress, as in the case of using it as an abutment for a bridge, do not go down to 18 or 20 karat gold, but go above 24-karat and use something that is alloyed with platinum, which will give you the necessary rigidity and at the same time be more favorable in the way of accurate adaptation to the cavity.

Those are the lines, gentlemen, along which you should investigate and which you must reason out for yourselves.

Another thing we should remember: It has been a well established practice of my own, for several years now, to be experimenting with these different methods of casting gold. The crude machines that are on the market are just the very first thought of a man who has already had the idea and invented them. That is, the principle of the cast inlay has been told to him, and he has gone to work and tried to reason out a machine for doing that work. He formulates a principle of construction and puts it into a device for molding. That device is, as a rule, the first thought which comes to a man who is a mechanic, and not an inventor or

a genius who reaches out and takes into consideration the ultimate results desired, but is simply following out the mechanical idea of construction.

Now, as regards the underlying principle of the casting process in this inlay work, I have found this to be the fact: That where you get nothing except a sudden impulse, and the pressure ceases, you do not hold your gold in the condition it ought to be held, while in a liquid or semi-liquid condition. In other words, gentlemen, the gold should be retained under a continued and sustained pressure while cooling in the mold. The reason for that is this, as I have worked out the theory: When the gold is first thrown into the mold, as it would be with a sudden impulse, it strikes the cold walls of the mold and immediately there is a film of hardened, stiffened gold lining the walls of the mold, while the balance of the gold is still in a liquid condition—the sprue and the excess of gold not having had a chance to come in contact with the cold surface of the mold, so you have a thin, tissue-paper shell of gold filled with the molten liquid. If your pressure is withdrawn at the moment when this molten gold in the interior of the mold begins to solidify, it will certainly drop away from the sides of the mold and this gold lining with which it is first coated; whereas, if you are back of it with a "plunger," and by that I mean the pressure of the column of air or gas that is back of it, you keep pushing that molten gold into place and thoroughly pack it into that mold. If you keep the pressure continuous, the outer shell keeps on growing thicker and thicker, and the pressure is still acting upon the inner portion of the gold to keep it expanded out to the walls. This has a wonderful effect upon the fit of your inlay. Do not delude yourselves with the belief that because these inlays you have made are so much better than the matrix inlay was that you should be satisfied. Remember, there never was a time in dentistry, or in any other of the arts, that anything was ever done too well; and that holds good in this particular case.

Now, we come to another principle in this process. That is in the mixing of the investment. Have you always mixed it simply by what you call the "rule of thumb"—no rule at all? Take a certain amount of water, which you think is about sufficient, and put in your cup of plaster and stir it. It is thin and milky; you

put in some more and it gets a little bit creamy; you put in some more and get it to what you think is about the proper consistency, then put in a little bit more, and now you find it is too stiff; then you go to your water can and put in a little more water, to make it thinner, and in doing so, just at that stage, unless you are exceedingly careful, you add just a little bit too much water and it comes back to being too fluid; you then put in some more of the material, and succeed in getting it to what you think is the proper consistency, but that right consistency has not been secured by using the right proportions of water and investment material, but because you have manipulated it long enough that it begins to assume the consistence necessary for your use. Now, just consider for a moment this fact: The material which you first put in has been five times as long in contact with the water as that which you last introduced, and consequently is not in harmony, chemically or mechanically, with the material which has only been acted upon by the water a very short time. If you were engaged in a delicate chemical process, you would not think of putting two chemicals together in such a slovenly way. Now here is where the scientific side of this seemingly simple process comes in, and I shall have the pleasure of demonstrating it to you tomorrow in my clinic, as I will endeavor now to do by word of mouth.

I think for about thirty-two years I have been mixing investment material in practically that same haphazard way; always trying to do it the best I knew how, and yet never seemed to secure results twice alike. When I first started in with this proposition, I sought to secure a more scientific and therefore a more accurate basis upon which to carry out all these details, and by and by I hit upon this device: I secured a couple of little dishes, one of which would contain just the right quantity of plaster when it was put in loosely and scraped off even and flush with the top; the other was a smaller vessel which contained just the right amount of water to secure the right consistency in the mixture of the two. But I found there were times in filling this first dish I would get a little more of the investment powder in it, by condensing it too much in dipping it into the dish at one time, more than I would at another time, and, consequently, the amount of water being

always the same, this little addition of investment material would not secure for me the same consistency in the mix, although it would come nearer to it than the old method. Therefore, I set to work to devise a scheme, and I have now evolved a method by means of which it does not make any difference how much investment I put in, I can always balance that by putting in sufficient water on the opposite scale to make the proper proportion, and thus have brought to bear a little science in the matter of securing uniform results in making my investment.

So that, by following closely these scientific methods, if you find you are able to make an investment and a filling today which suited you, you know that tomorrow you will be able to mix your investment the same way, and thus secure the same results.

For that reason, I say, gentlemen, study out the scientific side of these matters of detail a little, and you will eventually arrive at the point where the only deviation from accurate results will be your own individual carelessness. The personal equation then enters the field and alone prevents you from securing absolutely scientific results.

By the personal equation I mean this: There is a point where men are not all equal in ability, in patience, in industry and willing to pay attention to details. But if you have those details all worked out for you by someone else and a rule established, if you follow that rule closely, you certainly will secure the same accurate results.

Now, we come to the matter of putting the investment around the wax inlay, and that was a problem that was hard to solve. In doing my plaster work in former years, when I was using a great deal of vulcanite for plates, whenever I had a very particular case and wanted it just exactly right, I was in the habit of jarring and jolting the plaster of Paris in order to insure a smooth cast into which to pack my rubber, then packed my rubber in, and when the plate came out, the more particular I had been it seemed that more and larger bumps were on it. The plaster seemed to have air-holes and pits in it, and yet I had taken absolutely all the care I knew how to prevent that very thing. Now, what caused that, gentlemen? It was absolutely an unscientific and unreasoning way in which to handle that. There is a certain amount of contained

air in the investment, or plaster. That contained air is hard to get out, especially when mixed in a pasty condition. You put it in the flask and you think by jarring it you will force those air bubbles out through the plaster. But you do not do that. You simply cause that contained air to pass through the investment until it reaches the surface next to your wax, and after it strikes the wax no amount of jarring will break or dislodge it, and the only effect of further jarring is to cause the sisters, cousins and aunts of that molecule of contained air to also come up and make one great big family bubble. That is a condition which you must not ignore if you wish to get rid of those air bubbles. The way to eliminate this trouble is to mix your investment by these scientific methods I have told you about, putting it into your plaster bowl and then turning your plaster bowl over on one side, laying it down and jarring it, and as you jar it, also rotate the bowl, and that glares the whole inside of your plaster bowl with a thin layer of investment; you keep on jarring and rotating the bowl, and those little bubbles of gas or air, as they are rolled over that thin surface, are made to come up to the surface and broken and dispelled, whereas they could not be gotten rid of by any amount of jarring when the investment material is in place surrounding the wax inlay.

There are a number of points that will possibly come up here during the discussion this evening that I may be able to further enlighten you on. I believe that this is a process that has come to stay with us. It is a process by which we can secure for our patients something which we never have been able to attain before. The whole process commends itself to the spirit of the times, because in these later years mankind has become more nervous, more high-strung and impatient of slow methods. There are vibrations in the buildings of our great cities and exciting causes surrounding us that keep us all strung up to the highest tension. Any man who has been in dentistry for ten, fifteen, twenty or thirty years has found, and will admit, that patients today are more impatient and make more fuss over dental operations than they ever did. For that reason, I say that this process commends itself to the spirit of the times as a means of meeting that condition of nervousness, irritability, peevishness and excitable

eagerness to get rid of and unload disagreeable things onto other people. For that reason this process has come to stay, for it does fill in a niche that other processes do not.

I formerly was a most prolific user of rubber dams. I can say now that in four years I have only bought my rubber dam material in small pieces and just for the purpose of treating an affected tooth; but I have not put a rubber dam over a tooth for the purpose of filling it, in that length of time. What does that mean? It means a great saving of discomfort for the patient, and to me a saving in time favorable to my eagerness to accomplish things. I have around me a class of patients that expect it because I charge them for it. If they expect it because I feel that it is the best way to handle this, why cannot you gentlemen eliminate this disagreeable side of dentistry in your practice, whether it be a country or a city practice, or even if you are located where you do not get as high prices for your work as some others? Why is it, if the city dentists make a success of this, that you cannot? You will find that patients and the lay public will demand it of you, and it is a great deal better for any dentist to keep ahead of the profession, rather than have his patients come and say: "Doctor, do you use this modern way of filling teeth? I heard that Dr. Smith was filling some teeth for Mrs. Jones that way, and it was simply beautiful work and she had none of the discomforts of the old way." Do not allow any of your patients to come into your office and tell you what you should do to keep in touch with advanced processes. Do some experimenting, and have the appliances around you with which to do the work. You will find that this process is essentially an old man's proposition. I say that, because it permits one who has spent years of toil at the chair to do much more work than he could accomplish in his palmiest days. He has but few years to live, and can but welcome any lightening of his burdens. It is also essentially a young man's process, because the young man has so many years before him, in the ordinary course of nature, if there is any way in which the burdens of himself and his patients can be lightened he is justified in taking advantage of it.—*Western Dental Journal.*

SUPERIORITY OF NATURAL TEETH OVER ARTIFICIAL SUBSTITUTES. By H. W. McMillan, D.D.S., Roseville, Ill. Very many strictly scientific papers have been contributed to dental literature, and doubtless very many more will be written in the future as our profession develops; but does it not seem proper to review some of the knowledge we already possess that the investigations of the years to follow may be directed principally in that branch of dentistry which up to the present has resulted in the greater good to humanity—namely, the operative? I believe prosthetic dentistry has and will continue to have its place and use, but I also believe that it will be largely *supplanted* and overtopped by the growth of the idea of prophylaxis as the profession and the laity become better informed concerning the relative service rendered by these two departments of dentistry. I believe the dentist of today and also tomorrow and of the æons to come should be an enthusiastic idealist who is able to radiate the truth in the highest conceptions, that his influence for good may be felt by others of his profession, and by the people he serves. He who does less is a shirk, a drone in the beehive of industry, a barnacle on the ship of progress. A stock phrase of his is: "I can't," and that of a crowd of his kind is: "It can't be done."

This paper will be a collection of facts and deductions, gleaned from the fields of thought traversed by others, and no claim of originality is made, save perhaps in the manner in which it is presented.

I am a firm believer in, and advocate of, cooperative phophylaxis, and skilful diagnosis, to the end that the natural teeth may be erupted in correct alignment and occlusion, that decay in them may be prevented, or discovered and remedied at its inception, and that pyorrhea may be prevented from attacking the structures which support their roots.

I believe in a thorough study of the first causes of abnormal conditions, that they may be removed and the consequent evils prevented, that the individual may develop with that harmony and symmetry which the Divine Creator intended.

Long before there is a demand for prosthetic dentistry, the need for operative dentistry exists; and long before there is a demand

for operative dentistry, there is a need for prophylaxis and diagnosis.

Among the people of the United States there are but 14 per cent who *employ* dental services intelligently, or, in other words, make the demand at the time of the need.

Every effect has its cause, and it might be discovered upon investigation that among the dentists of the United States there are but 14 per cent who *perform* dental services intelligently, which includes instruction to the public, demanding that they cooperate with the profession, that the right thing may be done at the right time.

Let us now consider some of the common causes of loss of function of the natural teeth, that they may be prevented and the prosthodontist *supplanted.*

First, irregularities, which in themselves favor tooth loss by bacterial invasion proximally and gingivally, caused by the increased difficulty of cleansing, may be prevented years in advance of the condition which follows neglect. One of the frequent causes of irregularity is premature extraction of deciduous teeth, and neglected filling of the same, as they are frequently and wrongly extracted to relieve pain caused from pulpitis or abscess, the result of neglected prophylactic treatment and filling. Deciduous teeth were intended by nature to be shed at the proper time, and extraction is rarely justifiable, especially the extraction of the deciduous molars. Such teeth require treatment and filling if the child has not reached the proper age for their natural loss through the shedding process. The second deciduous molars lost by extraction at the sixth year is a certain invitation to irregularity and deformity in the permanent teeth, caused by a forward movement of the first permanent molars from which the other teeth take their positions, causing one of two deformed conditions—either irregularity or protrusion. If children's teeth are given proper care they will retain vital pulps and be shed naturally. Irregularities caused by delayed extraction occur principally in those whose pulps have not been kept vital, and extraction of these at the proper time is justifiable. The extraction of the first permanent molar, in which decay commonly exists very early after eruption and which is frequently mistaken by the parents for a deciduous tooth, is often a

cause of irregularity. Other less common causes of irregularities might be mentioned, but that would make this paper too long. Whatever the irregularity, it could have been prevented and by proper treatment by the orthodontist can be cured if taken in the period while bone formation is still active. If later than this, much improvement in appearance can be secured by the artistic and judicious use of carborundum stones, shaping the outlines of the cutting edges of the anterior teeth into more uniform and harmonious lengths and positions.

Some may ask what has all this to do with the superiority of natural over artificial teeth? It has this: That irregularities of the natural teeth may be either prevented or corrected wholly or in part at any age, and irregularity of itself is no justification of the extraction of natural teeth that artificial may be inserted.

A second common cause of loss of function of the natural teeth which may be prevented or remedied by operative dentistry and the prosthodontist supplanted, is caries. We owe much to the original scientific investigations of such men as the late Dr. W. D. Miller of Berlin, who discovered the true cause of caries. We are debtor to the genius of Dr. G. V. Black of Chicago for the well-known cavity preparation embodying the principle of extension for prevention, and we are debtor to Dr. W. H. Taggart for the existence of the cast inlays.

That decay is preventable is not now an open question. Clean teeth do not decay. True, faulty development and faulty alignment will call for extra care, but the fact remains if a nidus is not permitted to form a cavity will not follow, as the former is invariably the forerunner of the latter.

I believe any individual's natural teeth may be saved from childhood to extreme old age, if the proper care is given them at the proper time. The examinations should be made at intervals sufficiently frequent to prevent any cavity which might form from extending beyond the first stages. By neglect, every degree of decay is passed through, until an inlay involving the entire crown may be required, and treatments and root fillings be necessary under it; yet the value of a natural tooth and its superiority over the artificial is so great that the end justifies the means, as will be shown later on in this paper. Patients will in their ignorance ask for

the extraction of such a root, but should be informed, if it be a molar, that they are losing 15 per cent of their masticating area upon that side, and that it is wrong practice to remove savable roots, and by saving such a root with an inlay the necessity of a bridge is avoided. The case cited is, of course, an extreme one, but if the root be firm it is a case for an inlay worker and not for extraction.

Therefore decay in itself, so long as only the crown is involved and the root remains firm, is no justification for extraction of the natural and the insertion of the artificial. Such a tooth, though inferior to a perfectly sound natural tooth, is yet far superior to an artificial tooth on a plate.

A third common cause of loss of function of the natural teeth, which may be prevented or cured by operative dentistry and the prosthodontist supplanted, is pyorrhea. Dr. D. D. Smith of Philadelphia cures pyorrhea and every dentist can cure it as Dr. Smith cures it if he does as Dr. Smith does. He extracts the teeth which are hopelessly incurable and cures the others by thorough removal of irritants aided by local medication. To supply the missing teeth lost by neglected and incurable pyorrhea and by neglected and incurable roots in which caries has progressed to such a depth that they cannot be saved, is the legitimate field for the prosthodontist, a field which will grow less and less as the masses become educated to a proper conception of the value of their natural teeth.

It is a deplorable fact that all prosthodontists do not confine themselves to this legitimate field, but extract teeth that could and should be saved.

Pyorrhea can be cured, and it of itself is not necessarily a justification for the extraction of natural teeth and the insertion of the artificial.

As irregularity, decay and pyorrhea of themselves are no justification for the extraction of natural teeth, and we see the broad field of opportunity which opens up to the master of prophylaxis, and of diagnosis, and of operative procedure, with the birth of every generation, and we see the very narrow legitimate field of the maker of artificial teeth, which decreases as the masses become educated, let us next consider some scientific tests which have been made, and are a matter of record but not a matter of com-

mon knowledge, at least by the laity, and I dare say by a great many who are now practicing dentistry, especially prosthetic dentistry.

Truth should be the object of our most vigilant search in dentistry, and this is best obtained by scientific tests, with scientific instruments, and a study of the records of such experiments.

Two of these instruments which have been used in dentistry are the gnathodynamometer and the phagodynamometer, the former being used to ascertain the amount of pressure *obtainable* on forcible closure of the jaws, and the latter determines the amount of force *exerted* upon the teeth in crushing various articles of food.

The gnathodynamometer, as an analysis of the name indicates, is a measure of the gnawing power. The first instruments for this purpose were invented in 1893 and exhibited at the World's Columbian Dental Congress by Dr. George J. Dennis of Chicago. Though at first crude and inaccurate, similar instruments have been constructed, and one has been perfected by Dr. G. V. Black, to whom in so many ways we are greatly indebted. This instrument will be exhibited in the clinic and, although old to quite a number, I feel sure a demonstration of its use will be new to very many.

The first demonstration I ever saw with a gnathodynamometer was at the Fourth International Dental Congress, at which Dr. Eugene R. Warner of Denver, Colo., made some tests of which I have no record. In 1905 at the meeting of the First District Dental Society of Illinois I secured Dr. Warner's instrument and made sixteen tests upon natural teeth which averaged 155 pounds pressure. The test is made upon the first molar teeth, as upon trial it is found that the maximum of stress can be exerted upon these. A number of those tested had lost the first permanent molar and the resultant test is therefore lower than it should have been. The limit of the instrument was 300 pounds, yet Dr. W. T. Rutledge of Monroe City, Mo., raised the index to the extreme limit and held it there. He has the full complement of teeth in normal occlusion. I tested two with the instrument, both of whom wore plates, both upper and lower, and neither could raise the index above fifteen pounds after repeated efforts.

There are at least two causes for this. The primary cause is

the pain produced in compressing the gums between the plate and the bone. One who has worn plates has consequently learned to chew lightly, thus bringing on through disuse the secondary cause—an atrophy of the muscles of mastication. The first cause given—that of pain produced—is, however, the limiting condition, as is also the limiting condition of those tests made upon the natural teeth. Each one being tested stops from pain rather than from lack of power.

Dr. G. V. Black in the *Cosmos* of June, 1895, goes into this subject in a highly interesting, scientific and practical way. Quoting from his paper, he says: "On full plates, upper and lower, the stress exerted has been from twenty to thirty pounds. On upper plates with natural teeth below forty pounds has been exerted in a few cases.

"These trials show artificial teeth to be sadly deficient in masticating power as compared with the natural organs. Perhaps it is well that so many persons fail to realize what they have lost, and as the recovery of it is not within the range of possibility, perhaps the less said about it the better. But a study of the records of the gnathodynamometer and the records of the phagodynamometer shows only too plainly what it is."

Having indicated the great loss of power sustained by those who have had natural teeth extracted and artificial teeth inserted, let us next consider whether there is sufficient power exerted upon artificial teeth to properly masticate ordinary foods. To demonstrate this it became necessary to invent an instrument which would register the number of pounds necessary to crush the various articles of diet. This instrument—the phagodynamometer—is the invention of Dr. G. V. Black, and was first demonstrated in 1895. It consists of two opposing occlusal surfaces, simulating the upper and lower first permanent molars in mastication. Between the two occluding surfaces is placed the food to be crushed, and pressure is brought to bear upon the upper cusps by means of a lever. The lower cusps transmit the pressure through a slide upon a scale beneath, thus weighing the amount of force necessary to crush the food. Again quoting from Dr. Black's paper:

"PHAGODYNAMOMETER RECORDS.

"Crushing point of meats:

1.	Boiled corn beef, nice and tender	30-35 lbs.
2.	Beefsteak, medium well done, chuck	40-60 lbs.
3.	Beefsteak, well done, chuck	45-60 lbs.
4.	Beefsteak, rare done, very tender, loin	35-40 lbs.
5.	Beefsteak, round	40-50 lbs.
6.	Beefsteak, well done and rather tough	60-80 lbs.
7.	Mutton chops	30-40 lbs.
8.	Mutton steak	35-45 lbs.
9.	Roast veal, tender and nice	35-40 lbs.
10.	Roast loin of veal	30-35 lbs.
11.	Roast beef	45-60 lbs.
12.	Roast beef loin	35-50 lbs.
13.	Pork chops—loin	20-25 lbs.
14.	Roast pork	30-35 lbs.
15.	Broiled ham, tender and nice	40-60 lbs.
16.	Cold boiled tongue, central part	3-5 lbs.
	Near root of tongue	15-20 lbs.
17.	Cut from shank of an old animal—	
	Fried, rare done	60-80 lbs.
	Fried, well done	70-90 lbs.
18.	Cut from the neck	70-90 lbs.
	Cut cabbage (cold slaw), crushed at	40-50 lbs.
	Lettuce	25-30 lbs.
	Young radishes	20-25 lbs.
	Lemon tablets	60-70 lbs.
	Crystals of rock candy crushed at	30-45 lbs.
	Hard candy marbles, ¾-in. diameter	70-100 lbs.
	Ordinary hard stick candy, old	90-110 lbs.
	Ordinary hard stick candy, fresh	45-70 lbs.
	Lemon drops	60-75 lbs.
	Small cinnamon drops	30-50 lbs.

"Small stick licorice was crushed only enough to show plainly the indentations of the teeth at two hundred and fifty pounds."

The phagodynamometer demonstrates the pressure *necessary* in mastication and the gnathodynamometer demonstrates the pressure *available* in mastication. Taken together they prove that the

natural teeth can crush with ease that which artificial teeth fail to crush with the greatest effort.

These are tests of which we have all heard too little and of which the general public know practically nothing, and it is our duty to instruct them. I agree with Dr. Black that any amount of instruction along these lines will not call again into being powers which the many patients have already lost in the extraction of their natural teeth, and perhaps the less said about it to them the better. I believe, however, that he will agree with me that to those who have not already lost their natural teeth a great deal said upon these subjects would be better than silence.

It is this phase of the subject which induced me to write this paper. I believe it is our dental duty to familiarize ourselves with these tests which furnish us with argument and instruction which we may use daily at the chair, and prevent many from taking that step (the extraction of the natural teeth) from which there can be no reconsideration—and I believe more good can be accomplished by the earnest statement of facts by the dentist than by resorting to printed matter.

Considering the results of these tests, I believe it is our duty to give greater attention to the development of the operative branch of our profession and less to the prosthetic. We should give increased attention to prophylaxis preventing the destruction and loss of the natural teeth, as they are best for service, and less attention to artificial teeth, for they give the least of service.

This is the tendency of our profession today, and it is an indication of the progress operative and prophylactic dentistry has made, and in which there is yet so much room for improvement. When we consider that there is only about 14 per cent of the population of the United States who make an intelligent use of dentistry we find the large majority ignorant of that which is for their own best interests.

I have written to twenty-five dentists who have been engaged in the practice of dentistry for a period of over twenty-five years asking them the following question: "How does the number of teeth extracted at the present time compare with that of twenty-five years ago?" The question was answered in various ways, ranging from 50 per cent down to less than 1 per cent, averaging

perhaps 10 per cent, or, in other words, one tooth is extracted now where ten were extracted twenty-five years ago. These questions were all asked of high-class men, some of whom do no extracting and have established operative practices, and it is among this class of practitioners that the extractions have grown so rare. They are men of high ideal, who do for their patients those operations which they would wish done for themselves if they were in their patients' place. They are men of attainments, of science, of ethics, and if all dentists were of their stamp of nobility there would be more faith and less failures in dentistry. There would be a better, a stronger and a happier generation to follow, because their dentistry would be performed in harmony with the dictates of science and common sense.

The natural teeth are superior from a pressure standpoint, and this I believe to be the most important one, as upon this depends the service. However, there are also several minor points worth mentioning, among which is the attachment. Those who wear artificial teeth are limited in the amount of lateral motion employed and are confined principally to vertical movements. If the cusps are left prominent they interlock and much lateral pressure will cause a displacement upon the gums of either one or both plates, this being most liable to occur with the lowers, especially if the alveolar ridge is flat or obliterated. This tilting or dislodgment permits small irritants, such as berry seeds, to get under the plates, causing much discomfort. This lack of rigid attachment produces some degree of lost motion. This is best illustrated by two millstones moving in the same direction at the same speed, limiting the grinding power. This occurs in greater degree where full upper and lower plates are worn. If the cusps are ground flat to prevent to some extent this displacement, the utility of them for mastication is impaired, for it is found that it requires much stronger pressure to crush substances between flat surfaces than between those which are irregular, such as the occlusal surface of the natural teeth. While the artificial teeth are thus limited in lateral motion and only surface adaptation, and the natural being firmly implanted in bony tissue to the depth of about half an inch, there is a consequent freedom of lateral motion, and the posterior natural

teeth are very appropriately termed molars, for they also grind in addition to their adaptation to crush.

Another superiority of attachment of the natural teeth is observed in the mastication of sticky materials, such as taffy, caramels, etc., which lift plates from their position; thus not only is the motion limited, but the choice of some of the good things of life.

Some systems require a wide range of food to repair and rebuild the various structures of the body, thus keeping them in health; it is readily seen that the preservation of the natural teeth will permit the mastication of a much wider range of diet than that which is limited by the inefficiency of artificial teeth. This wider selection of foods gives a greater variety and by supplying the elements needed increases the longevity of the individual. It is true that some apparently live as well without any teeth of any kind, but this is putting an extra burden upon the stomach and intestines, which they sometimes carry without apparent loss, but under which they often fail, resulting in degeneration, debility and disease.

Another freedom which natural teeth permit which is denied those who wear artificial teeth is that of the facial muscles in the region of the mouth. Many full plates are held in position by the tension of the lips compressed and drawn. This results in a constrained, half-paralyzed expression to the face which is distressing to see. Expression of the emotions, especially of laughter, is usually constrained. Laughing eyes and a half-mournful mouth are incompatible and incongruous. With the extraction of the teeth and attendant absorption of the alveolar process and atrophy of the muscles of mastication, there is a shrinkage of the cheeks no plumpers can perfectly supply.

Another advantage natural teeth have over artificial is in the appearance of the teeth themselves. There are many cases where it is impossible to get an ideal result with plate work on account of the prominence, distortion and irregularity of the alveolar ridge. No pink gum has ever been invented which perfectly imitates the natural, and the same may be said of the teeth themselves.

Another fault of plate work is the disparity of the shrinkage of the process between the upper and the lower jaws, the process

shrinking principally from the outside inward with the upper, and from the inside outward with the lower. This accounts for the narrow, small upper plate and the broad, large lower plate required for those who have reached advanced years and who have had the natural teeth removed at an early age. This condition is frequently met and is finely illustrated in "Cryer's Internal Anatomy of the Human Face."

In this condition to restore the normal length of the face requires very thick plates in the alveolar portion, resulting in increased leverage and consequently decreased service. When no teeth are inserted it results in a great disfigurement, the chin being thrown prominently forward and close to the nose with a falling in and wrinkling of the skin around the mouth.

With the rapidly developing science of orthodontia, with the increasing light we are constantly receiving upon the treatment of pyorrhea, with the benefits derived from prophylaxis, with the perfecting of operative procedures, there is less and less justification of tooth extraction, and the time is surely coming when the people will in increasing numbers demand the highest skill for the saving of their natural teeth. The men of high ideals in our profession are not appreciated at the present time by the general public as they should be, but as no effort for right is ever entirely lost, there will be a compensation for a life spent in harmony with right principles.—*Dental Review.*

GENERAL CONSIDERATION OF SYPHILIS WITH SPECIAL REFERENCE TO DIFFERENTIAL DIAGNOSIS BETWEEN SYPHILITIC AND NON-SYPHILITIC LESIONS AS MANIFESTED IN THE MOUTH. W. H. G. Logan, M.D., D.D.S., Chicago. Syphilitic manifestations that occur on portions of the body other than the head and neck and involving the oral cavity need not concern us in this essay, which only assumes to deal briefly with the general question of syphilis.

Acquired syphilis is a chronic infectious disease, which fact is established by the knowledge that it is only transmitted when the syphilitic virus is conveyed from an infected individual into the system of a non-syphilitic person by either the mediate or immediate route. Since its course and its capabilities of indefinite multi-

plications in the human body only occur after introduction of the virus into the system in this form of syphilis, this fact tends to make us feel sure that a syphilitic organism is the causative factor; yet no investigator has isolated and cultivated the specific organism to the entire satisfaction of the dental and medical professions. The poison through whose inoculation human syphilis is produced is propagated within the human organism, where it is with few exceptions alone reproduced, and when implanted in the human system it excites inflammatory processes of the most varied extent and intensity.

In my descriptions of the manifestations of acquired syphilis, I will divide them into the customary first, second and third stages, however not so much because I believe such divisions are demonstrated in many cases or that the spoken-of periods of rest between these stages are always seen, but holding to the old classifications to avoid departing from an established custom.

It is assumed that syphilitic infection only occurs when the virus is brought in contact with an abraded surface of the skin or mucous membrane by direct or indirect transfer, yet the likelihood of contamination of the human economy through some unabraded mucous membrane where the virus is allowed to remain upon a shielded location for a long period, cannot be dismissed as an impossibility.

Assuming that this form of infection has been brought in contact with an abraded surface of the lip, skin or mucous membrane about the vermillion border through the act of kissing or by drinking from a broken utensil or the use of a pipe or handkerchief that has been contaminated with the syphilitic virus, or from the physician's or dentist's instruments or fingers that have had the infected secretions from the mouth of a previous patient dried upon them; the syphilitic virus having gained entrance into the system by any one of the direct or indirect modes of transfer spoken of, we will have developed at the seat of infection a local manifestation, which in form and time of occurrence is characteristic and to a great degree diagnostic of this disease. This initial lesion is always local and only single in its manifestation except in those rare cases where the virus has entered the body in more than one place at the same time. This resultant lesion is known as the

hard chancre, which as a rule develops in three to six weeks after infection. This tissue becomes infiltrated with small, round connective tissue cells, and with these small, round cells are also to be seen large, round or oval wandering connective tissue cells, filling up the tissue spaces to such an extent that they interfere with the normal function of and nourishment to the part. And the overlying tissue takes on a discoloration that is slightly dusky and the normal thickness of the lip in the area is increased and slightly elevated with smooth and glazed walls of tissue that in most cases surrounds a cartilage-like mass that seems free in the tissue when examined between the thumb and finger. The exudate in the meshes of the cellular tissue is so abundant that a certain small but well-defined area becomes practically solid, but which has a freedom of movement that is not common to any other diseased condition found in this particular location.

The patient usually does not complain of any pain or even a slight discomfort from the development chancre until the process of ulceration begins, which is in about four to ten days after full development. The superficial cells ulcerate, with necrosis of the central area quickly following, and a copious and highly infectious discharge now comes from the crater-like opening that is forming on the lip.

After the indurated, cartilage-like mass has been cared for by necrosis and putrefaction, we find the healing process begins, and the lost area is filled in with embryonic tissue that may as it grows old temporarily form some scar tissue; but when the process of regeneration of the lost area is completed, we find no characteristic scar remaining.

As the chancre develops and begins to break down, we observe the lymphatics nearest the point of initial infection being extensively involved, and this lymphatic induration marks the opening of the second period of incubation, or systemic manifestation of this disease.

Characteristic symptoms of the second stage in a typical case of acquired syphilis, with special reference to the oral lesions.—The period intervening between the developing chancre and the occurrence of the systemic symptoms of skin and mucous membrane eruptions is called the second incubation period, and is of about

six weeks' duration. The systemic infection passes from the point of initial entrance throughout the entire system by means of the lymphatic and blood channels. We note the lymph capillaries especially taking up the greater part of the tissue fluids flowing back from the periphery and uniting to form large vessels, and carrying the virus to the nearest glands. The returning blood vessels and veins also no doubt take up the virus from the induration and carry it to the rest of the body, but in the case of the lymphatics we have clinical and histologic proof of the role they play in disseminating this infection. First we see the glands in the immediate area progressively becoming involved at a point just beneath the mandible on the right side, and it is not exceptional to find most all of the glands of the entire body that can be palpated slightly affected.

As the entire system is gradually becoming contaminated with the virus during the second period of incubation, the patient may or may not notice any variation in his general health. However, in about 50 per cent of the cases pronounced subjective symptoms occur before any of the eruptions common to the secondary stage present on the skin or mucous membrane. In those cases where pronounced subjective symptoms do occur, we see quite profound general depression and a fever of one-half to two degrees in the evening in a few cases; fleeting pains about the face and joints, pronounced headache, and all of these disturbances more severe at night.

General secondary symptoms of acquired syphilis.—The prodromal manifestations just described having presented, or, in case of their absence, a sufficient duration of time having elapsed, which in an average case will be between one and two months, we find the macular, papular and pustular eruptions coming over the entire body. We do not find so many or frequent eruptions coming on the face as upon the scalp and eyelids and on the neck just below the hair.

These lesions heal with or without treatment, as do practically all of the secondary lesions, without leaving a characteristic scar, and because of this knowledge the fact is ofttimes overlooked that a secondary syphilitic affection may occur and leave a scar which can be recognized so long as the patient lives as pathognomonic of

syphilis. This form of eruption appears during the second stage as one of the late manifestations of this period, and is known as "rubia" or the "rubial syphilide," that are large, pustular eruptions, which terminate in ulcers that have formed over them oyster-shell-like layers of crusts. This process gradually improves and leaves behind it a dead-white circular cicatrix with a rim of pigment. The white, wavy, characteristic line only involves the skin and is in appearance and thickness like tissue paper, and when examined folds similarly. No other systemic disease or skin lesion leaves such a marking, and the only way a like scar is ever seen to be produced is from a splash of molten metal. These systemic markings, if they be present, are most frequently found on the sides and back of the neck just below or at the border of the hair.

Besides these eruptions, and involvements of the eyelashes, brows and hair, the general involvement of the lymphatics and the induration of these glands in the second stage are found to be bilateral, yet those nearest the point of original infection are by far most extensively involved at first. Red blotches may appear upon any portion of the surface of the body, and are especially prone to occur on the soles of the feet and palms of the hands.

Oral manifestations of acquired syphilis that occur during the second stage.—We find presenting upon the mucous membrane of the oral cavity eruptions quite similar to those seen on the skin. The first oral manifestations of the secondary stage of syphilitic infection is the appearance of a general dull red erythema involving the entire fauces. This erythema soon fades, leaving symmetrically disposed erythematous spots on both sides of the palate, the walls of the pharynx, the pillars of the fauces and the sides of the tongue. These mucous plaques or patches are among the earliest and most constant eruptions coming during this stage.

The areas next involved are those subjected to irritations from rough or sharp surfaces found upon carious teeth or broken-down roots, therefore we expect the eruptions to occur on the borders and tip of the tongue as well as the buccal mucous membrane, or upon the tissues forming the hard and soft palate. If one examines the patches closely in the mouth of a syphilitic patient with the mucous patches in full development he will observe the characteristic sharp line of demarkation between the healthy

and diseased tissue of the mucous patch proper with no extended inflammatory area about it in these uncomplicated patches. This development is more frequently accomplished without pain than with it; in fact, ofttimes the patient is not aware of the number present. Little if any increase in the activity of the mucous or salivary glands is observed unless an exceptional amount of disturbance accompanies their development. The mucous patch when covered with the normal secretion has a peculiar opalescent, whitish hue, due to the proliferation of the moist epithelium, and frequently through irritation or mixed infection it ulcerates superficially at the center, where they are of a dirty-red varnished appearance, with slightly thickened margins where this thickened epithelium is adherent.

The oral and mixed secretions, as well as the thin, viscid watery fluid secretion from the ulcerated surfaces of these plaques, and blood, is highly infectious during this stage, yet as a matter of interest it may be well to state that the normal saliva as it forms in the glands is uncontaminated with the syphilitic virus, and the same is true of the kidney and skin secretions when forming. However, please understand me as saying that the oral secretions are highly infectious during this period.

Some glandular involvement always co-exists with the mucous patches that accompany the skin eruptions common to this stage, but one must ever keep in mind that mucous patches do recur months, yes, years, after all secondary symptoms have subsided, and that they are not immediately preceded or accompanied by any other symptom characteristic of syphilis except glandular involvement, yet the secretions forming over their surfaces are capable of syphilitic infection. These recurring plaques are most often found upon those areas of the mucous membrane that are subjected to an unusual amount of irritation from rough points or the persistent holding of a pipe-stem. The longer the elapsing period since the initial lesion or hard chancre the less secretion is found forming over the plaque surface, and in the very old cases the patch is found to have a smooth, shiny surface and is bluish-white in color, that is likened to the condition known as leukoplakia or "smoker's patch."

The differential diagnosis between these late recurring mucous

patches and simple leukoplakia, if in fact it would be possible, is indeed difficult, and by some authors it is maintained that all forms of leukoplakia are of specific origin.

The early mucous patch differs from leukoplakia in that an excessive amount of secretion comes from the surface of the mucous patch, and when wiped dry has a varnished, raw-meat appearance, and its duration is short, often occurring on the under surface of the tongue and accompanied by glandular enlargement, and has no carcinomatous tendency. Leukoplakia is of long duration, and when the glands are involved it comes very late; never seen on the lower margin of border and under surface of the tongue, frequently develops into an epithelioma.

When one of our profession is called upon to differentiate between some of the lesions of stomatitis and the syphilitic mucous patch, with the rest of the body covered and the patient almost invariably opposed to having the truth known in case the condition is specific, he is confronted with a problem that is both delicate and difficult in the extreme, yet an accurate diagnosis is not only essential, but imperative, for his own safety as well as that of his other patients. So let us turn our attention to differentiating between the syphilitic patch that is ofttimes mistaken for certain forms of stomatitis that are not specific in origin, and other lesions that may be similar in appearance.

In the syphilitic patch we observe a sharp line of demarkation between the diseased and healthy tissue, while about the non-specific lesion in acute catarrhal stomatitis or an aphthous ulcer we see a gradual fading of the inflammatory process from the diseased into the healthy tissue, and these non-specific ulcerations are saucer-shaped areas in their formation, while the specific ulcers are found to form pouch-shaped openings with indented bases overhanging margins and the surface of this crater-shaped cavity is covered with a secretion which if wiped off leaves a varnished, raw-meat appearance not seen in non-specific lesions. Greatly increased oral secretions and pain accompany the development of the non-specific lesions of stomatitis. In the usual case of non-specific stomatitis no glandular enlargement, no definite location of the diseased areas is seen. In syphilitic lesions slight if any increase in the oral secretions occurs unless we have a mixed infection to deal

with, and as a rule little or no pain accompanying their development, the patient frequently unaware of the number present and complains of pain only in the evening if at all.

Pronounced glandular enlargement accompanies all the early syphilitic eruptions, and a few telltale ones are found accompanying even the very late secondary lesions. The location of diseased areas is quite definite. These localities are the tonsils, soft palate, margin of the tongue, and those surfaces of the cheek and gums that may be subject to excessive irritation by the action of sharp edges of teeth or the wedging of food in the approximal surfaces. Because of this fact one of our first duties is to remove such teeth that cannot be made ultimately useful, and precautions taken to prevent the continued impact of food between adjacent teeth, because slight local irritation gradually increases the number and duration of the existence of mucous patches. The dental organs must be kept free from deposit, thus establishing a condition that will allow the attending physician to carry his specific treatment along more rapidly and successfully.

The third stage, or the tertiary form of syphilis.—In the symptoms occurring during the tertiary or third stage we have the final lesions of a disease whose history is almost continuous with the life of the patient, although its periods of manifestations may be years apart. However, if proper treatment be immediately and persistently administered throughout life, the tertiary lesions can as a rule be avoided. In fact, 88 per cent of acquired syphilitic cases terminate with the final secondary symptoms.

As to the exact time the tertiary symptoms occur if they present, no definite statement should be made, because they do in a small per cent of cases co-exist with the symptoms common to the second stage, or they may be delayed twenty or thirty years with no intervening prodromal symptoms. However, in the majority of cases if tertiary lesions occur, they are found developing between the sixth month and sixth year after the active secondaries have subsided.

From a dental aspect the most important manifestations of this stage are the tumor-like developments that are known as gummata, that frequently attack the palate, tongue and mandible. Here we

have the characteristic destruction of the soft and hard palate by the formation of such gumma, and our final deformity is usually a round perforation involving bone and soft tissue that is located about midway between the anterior teeth and uvula, and situated quite accurately in the dome of the palate. The presence of such a deformity is pathognomonic of tertiary syphilis.

Finally, there is the condition of the tongue that unfortunately is too frequently mistaken for epithelioma instead of being recognized as a lesion common to this disease in the tertiary stage, known as gumma of the tongue. Epithelioma and gumma of the tongue differ in that the epithelioma, broadly speaking, develops slowly and always begins on the margin of the tongue, is single in its occurrence, and before as well as after it begins to break down lancinating pain is found to be a constant accompaniment. Also the odor of the escaping secretion, the presence of cachexia, and the glandular involvement, are all characteristic of epithelioma of the tongue. There is greater decrease in mobility of the tongue from epithelioma than when involvement with gumma occurs. In syphilis we usually see multiple lesions occurring on the under surface and dorsum of the tongue, and frequently reaching full development, without much pain, in ten to fifteen days. Nor does pain of a pronounced character co-exist, as the necrotic process begins to destroy the gumma almost in its entirety, which establishes a condition that never occurs in case of epithelioma of the part.

My idea in discussing this question is not that I hold it to be the dentist's duty to systemically treat this disease, but I do hold that it is the duty of every dentist to so equip himself that he shall be able to immediately differentiate the syphilitic from a non-syphilitic lesion in such cases as it is possible to do so, and the more one sees and studies this prevalent disease, with its varied and complicated manifestations, the more sure he becomes that no man can always positively differentiate without treatment every syphilitic from a non-syphilitic condition.

And now, if the above statement be true, and I assure you that it is, no dentist has a moral or legal right to employ instruments that may abrade or penetrate any of the oral tissues, that have not been sterilized by any process that will accomplish the same

end as would boiling them for fifteen minutes. These syphilitic individuals can be cared for with impunity if the operator protects his hands with rubber gloves and then scrubs all the instruments employed and boils them for fifteen minutes. If this plan is pursued there is no need of such absurd action as is often recommended—that all such instruments should never be used again but thrown away.

My advice to the young men of the profession is that in case of doubt about a lesion, always assume that it is a syphilitic infection that you have before you, but do not say so to the patient until you are sure of your diagnosis.

If, as a result of the reading of this paper, I have instructed even a few of the small number of dentists and physicians that have not in the past realized the gravity, danger and ease of transmission of this dreadful disease, I wish to assure you that I feel more than well repaid for my efforts.—*Dental Review.*

PUTREFACTION AND PATHOLOGIC CHANGES IN TISSUE. By George W. Cook, B.S., D.D.S., Chicago. By the term putrefaction we mean the action of certain forms of bacteria on tissue after the physiologic function of the structure has been partially or wholly destroyed.

The rôle played in pathologic changes of tissue by certain putrefactive processes is one that has been studied extensively by such investigators as Pasteur, Baumann, Brieger, Nenchi, Salkowski, and a great many others whom it would be unnecessary to mention here. It was Pasteur who first advanced the theory that putrefaction could not take place by bacteria in the presence of the free oxygen of the air. This theory was later supported by the investigations of Nenchi, Bovert, Kerry and Bienstock. The last-named investigators further claimed that this process was only carried on by a particular class of bacteria, namely, the anerobic. However, further observations were made that indicated facultative changes in dead organic substances, especially those which are rich in proteids.

In 1897-8 I made some observations on this question, with reference to certain bacteria that usually manifest themselves as putrefactive bacteria in the human oral cavity. I might say here that

these investigations were not very satisfactory, and the work was laid aside at that time, until the publication of some work in 1903 by Rettger. In his published works he gave some technique that would assist in the determination of certain putrefactive products in such materials as egg albumen and lean meat. Again returning to my work on this question, I used some facultative erobic bacteria isolated from the oral cavity, and especially one organism that I isolated from a putrescent pulp, which proved to be the bacillus putrificus cadaverous. This organism was one that is usually classified as a facultative saprophyte. It can under ordinary circumstances live as a parasite, but under certain conditions it is capable of breaking up dead organic substance and living as a purely saprophytic organism.

In order that we may more thoroughly understand the terms as they will be used in this connection, we will define what we understand by oxidation and hydrolysis. Oxidation, as we use the term in putrefaction, is a process where the decomposition of the proteid molecule is carried on by liberating oxygen in the decomposing mass. The intermediate products are more or less complexed oxycids. The oxidation of tissue, like in putrefaction, attacks the nuclei, even though they are in contact with living substance, while, on the other hand, hydrolysis in this same process simply splits up the main molecule by liberating a molecule of water, leaving the nucleus intact.

Many bacteria can hydrolize proteids and cause the liquefaction of gelatin and blood serum, and in such cases they split off carbon dioxid from the amino-acids, which are an acid group, and for a time leave the nuclei floating around in a liquid mass. Lycin and ornithin are usually acid in reaction. In such processes certain bases are ofttimes designated as products of putrefaction (monoamino acids). Cadaverin and putrescin are classed among the hydrolizing compounds, and are usually found in all putrefactive processes, where the complexed proteid molecules are hydrolized by the action of bacteria.

In the physiologic activity of the cellular substance of tissue we have hydrolysis and oxidation going on together in the body, and the products of such processes are carbon dioxid and water, and the intermediate products which ofttimes do not leave the body

for some little time after their formation are usually called leucomains. These last-named substances are analogous to the ptomains that are produced by oxidation and hydrolysis in dead organic substances by bacteria. In the synthetic building up of the proteid molecule we have dehydration of the nuclei by a sort of hydrolytic process. In this group is formed O H, which in living physiologic tissue must always remain as an O H group, and can always be detected there by Millon's reaction. In the decomposition of this group by bacterial action, in the majority of instances there is present a phenol which is split off from tyrosin. It will be remembered in this connection that a proteid molecule is amphoteric; in other words, the compound is slightly basic and slightly acid, and under some circumstances they manifest themselves as a base. It has been found by a number of investigators that organic substances are better explained by hydrolysis than by oxidation.

In order that we might study the putrefactive changes that take place by certain forms of bacteria in tissue, we obtained animal teeth and removed the pulps, under as nearly aseptic conditions as possible, and undertook the decomposition of this material by the action of bacteria. Five and ten grams, respectively, of this pulp tissue were obtained and placed in test tubes, that had been thoroughly sterilized, and after a slow process of fractional sterilization we inoculated these tubes with various forms of bacteria. Sterile capillary glass tubes were placed in the culture tubes leading into other vessels where the various gases were collected and examined, to see as nearly as possible what gases might be given off from this putrefactive process. And I will say here that some of these tubes were placed under anerobic conditions for bacterial growth, while others were used as erobic cultures. In the erobic tubes we had great difficulty in determining that putrefaction, in the strictest sense of the word, would occur except at the bottom of the mass. To give in detail the reactions that occurred in the anerobic tubes would consume a great deal more time and would be uninteresting. Suffice it to say that carbon dioxid and certain of the marsh gas series were detected as gases. Ammonia gas was detected, at the very earliest, about the tenth day of decomposition, and it seemed that in the majority of cases it did not appear until the twelfth or fifteenth day, while some members in the marsh

gas compounds appeared very early in the process and continued almost entirely from the beginning to the end of decomposition.

In the lower molecular forms of this series of compounds, in other words, the simple molecules of marsh gas are almost invariably in a gaseous state, and the thicker and the more waxy the gas becomes, the more complexed are these hydrocarbon compounds, and they sometimes, as you know, appear almost as a paraffin. I might state here in passing that it is to this substance that we have to look more closely for the discoloration of teeth in putrescent canals. There were about six members of this group we came in contact with that we have not yet made a complete analysis of regarding their combination with other substances in the process of decomposition. We could dwell at considerable length upon these compounds in putrescent pulps, but that is not the function of this paper.

In the study of this question of tissue decomposition by bacterial action, there are two main problems to deal with; namely, hydrolysis and oxidation. We have already stated that hydrolysis is the breaking up of compounds and liberating or adding to that substance water; while oxidation is the introduction of oxygen into the molecule of proteid-like substance forming different compounds. In the majority of cases the hydrolytic process is more common. The agents that influence both of these processes are in the main quite similar. As we have already stated, some bacteria hydrolize albuminous bodies, while others oxidize them.

In the process of decomposition of such substances as pulp tissue, we have in a great many instances both processes going on very much as in the synthetic organic substance. In the process of pulp decomposition by bacteria, absolutely in the absence of the free oxygen of the air, we have almost complete oxidation, and it might be well to state here that a large number of these bacteria are nitrifying. Thus, they are capable of oxidizing ammonia into nitrous and then into nitric acid. And in the decomposition of substances like that of the pulp, it is the amido-acid that furnishes the energy for the synthetic building up of the bacterial cell. In a great many instances we have formed in such processes a formaldehyd group, which we were able to detect in some of our tubes.

In the symbiotic action of bacteria we have these conditions so well established that it is of but little importance to discuss this phase at this time. Suffice it to say that all substances that influence the physiologic activities of the bacterial cell, or influence their destructive processes, play an important rôle in the class of compounds that are formed in the decomposition processes. In the decomposition of the pulp we found that a strong sodium chlorid solution influenced the formation of gases more than any other agent that was not capable of destroying the life processes of the bacterial cells. We later found that this fact was due to the liberation of the chlorin in the pulp tissues, and the chlorin combining with the methanes that were being formed there by decomposition. In a test tube containing ten grams of pulp tissue that was decomposing we could drop in one-half gram of sodium chlorid, and the marsh gases were completely arrested. On analysis, it was found that the halogen group of the chlorin series was formed, and this at once arrested the formation of the aldehyds, which is an important product in the decomposition of organic substance to form ptomains and many other groups of substances.

We also tested our products for fat and fatty acids and glycerids, to find that in the mass of tissue of ten grams we were unable to get a trace sufficient to enable us to saponify any of the products formed. Since we use the word saponification in this connection, we wish to make this term clear in order that there will be no misunderstanding. Saponification can only take place in a complexed molecule of organic acid by the introduction of a hydroxyl compound. It then becomes a base and reacts only with an acid. So an agent that saponifies has but little action in reducing of compounds formed in the decomposition processes of animal tissue by bacteria. Therefore, this source of destroying bacteria and the decomposition products formed in the breaking down of organic substance is not one that offers a very profitable field for investigation at this time.

With our present understanding of what is meant by oxidation, hydrolysis and saponification, we are able to approach the subject of antiseptics in the process of putrefaction by bacterial action.

Therefore, we will take up some of the agents that were tested for the arresting of pulp decomposition.

It might be said in this connection that these agents were made into solutions varying with the quantity of tissue that was being decomposed. We took a potash soap and added one-half gram to ten grams of tissue that was in the process of decomposition when the agent was added. We have previously stated that gaseous formations of the methane series were detected in all cases of decomposition. And when the agent applied to these tubes would arrest the formation of gas, we therefore made the interpretation that decomposition had been arrested. For instance, after the application of the potash soap in the quantity above stated had been reached, the formation of gas was completely arrested. We therefore designated this as an indication that decomposition came to an end. Quinin was added to twenty grams of decomposing meat in from one grain up, until it took ten grains of the quinin to arrest the decomposition, while three grains of salicylic acid would arrest the same quantity from decomposition. Now, the question would naturally arise, How long would this decomposing process be arrested? I might say that it is very questionable as to the exact time. In the case of quinin and salicylic acid, in the quantities above stated, they seem to permanently arrest the process, but when we transferred to fresh culture tubes a culture from the decomposing mass with the quinin, we got no culture. With salicylic acid we got culture. In the case of calcium hydroxid, one-half gram to twenty of the tissue, it arrested the decomposition processes for a while, and then the gas formation would start up, ranging from twenty-four to forty-eight hours. One of the difficulties that we found in this agent was that a portion of the mass that did not come directly in contact with the calcium hydroxid would go on decomposing, forming carbon dioxid, which readily changed the calcium hydroxid into a carbonate. And when this chemical change would take place, decomposition would again assume practically its original formation of gas.

I want to state here, with some degree of certainty, that none of the agents herein mentioned seemed to have any effect upon the neutralization of the gases, but the only way these agents arrested the process of decomposition was by their action upon the bacteria.

Therefore, antiseptics and disinfectants, in the sense that we understand the two terms, arrest decomposition by acting upon the protoplasmic structure of the bacterial cells that are actively engaged in the process of decomposition.

Therefore, in considering all of the factors that enter into the prevention of putrefaction and permanently arrest the activities of the bacterial cell process upon dead organic substance, through the agent or agents used as antiseptics and disinfectants, one of the striking differences in the decomposition process is whether the decomposing mass is confined in vitro, or whether the mass is confined in a pulpless tooth, in which the apical end of the root had been sealed. For instance, it required a great deal more of the agents to arrest the decomposition in the tooth than it did in the test tube.

The test tube experiments were made in the usual way, while the experiments that were made in the teeth were conducted in the following manner: Freshly extracted teeth, with as nearly sound crowns as possible, were taken and sterilized in the usual manner of fractional sterilization, not using any chemical agents for sterilizing. The roots of these teeth were filled in the usual manner. Portions of the tissue were put in the teeth and inoculated with putrefactive germs. When I say putrefactive, I mean those that were strictly anerobic. The tissue and the bacteria were then sealed in the tooth by a cement and paraffin, with a small capillary glass tube, puncturing the stopping, and the glass tube projecting into a gas-receiving bottle with various reagents to test the kinds of gases that were collected. It was not easy to add an antiseptic or disinfectant agent, but by removing the capillary tube, and with a medicine dropper with a point that would go into the capillary glass tube, these agents were dropped into the teeth, and the gas-receiving bottle was reattached. And the efficiency of the antiseptic was determined by the gas produced in the tooth itself.

It is a difficult matter to determine and explain the technic of the process. There are some crystallizable agents that we had considerable difficulty with in introducing into these teeth, but albumin-para-phenol-sulphonate, when introduced into these teeth, had a remarkable restraining power. One-half grain arrested decomposition for twenty-one days. I might say in this connection that

most of these teeth were embedded in little blocks of culture media with their roots down to about the enameled junction with the cementum. This was done in order that the surroundings of the teeth might be kept in as nearly a normal condition as could be in laboratory experiments. I want to say, further, that I was surprised at how difficult it was to fill a root canal with any material out of the mouth.

One of the misfortunes of this question is that we cannot always get the pathologic conditions in teeth out of the mouth or in test tubes. The natural pathologic conditions that are found in the mouth and which we are called upon to treat are very different from the one we have under discussion.

It is the vast difference of the two localities of the process that oftentimes gives us the impossible things to do in the treatment of teeth. In conclusion, we must say that the rapidity with which the diffusion of the agent takes place and the quantity of substance that it has to diffuse through are important factors. Secondly, we have to consider the period at which an agent is applied in putrefactive processes. One of the principal points that was observed in the work under discussion was the great difference of time which the agents took to diffuse themselves through the mass at the different stages of putrefaction, when the agents were applied, and the effect they would have on decomposition. For instance, those agents that diffused themselves through the mass more rapidly naturally arrested decomposition more quickly. If the agent was not suficiently potent to destroy the life of the bacteria, the processes of decomposition would soon be reëstablished and the gas formation would again assume its original quantity. For instance, it was found that formaldehyd gas manifested more rapid action on bacteria than did almost any of the other agents that were tested, but the processes of decomposition were in many of the tubes very early reëstablished. On the other hand, such agents as thymol and phenol-sulphonic acid diffused themselves through the decomposing mass very slowly. The decomposition processes were held in check for a much longer time, and in many instances they were completely arrested, and where they did return in the presence of these agents they did not make their appearance before the fourth day, and from that up to the eleventh day.

There are several points and several agents which might be discussed with prifit to the practicing dentist. For instance, in making up an application to a putrescent pulp in a tooth, it is important to bear in mind that none of these agents will arrest the formation of gases except as they affect the life of the bacteria themselves. Second, agents that diffuse themselves through a decomposing mass and temporarily prevent bacterial action have not destroyed the bacteria, nor has their activity been completely prevented; third, that the period at which we make the application to the putrescent pulp tissue is one that figures very largely in the results we obtain with various agents; fourth, all agents do not affect decomposition at the same period of the process in the same manner; fifth, that if pulp decomposition is going on slowly by hydrolytic processes, the cresol forms of antiseptic will prevent decomposition for a longer time than any other agents; sixth, in the oxidation processes of pulp decomposition, such agents as diffuse themselves rapidly, like formalin, will temporarily arrest the process much more quickly, and in many instances the patients would be relieved in a much shorter time than they would with some of the agents that act more slowly; seventh, it should be remembered that there are no specific agents for treating any pathologic conditions; eighth, it should also be remembered that a putrescent pulp in a tooth, in the absence of the free oxygen of the air, is being hydrolized instead of being oxidized, and that the hydrolytic products neutralize antiseptic agents more readily than when we have oxidation.

The work here presented is not with the expectation or with the understanding that we have completely settled this question, but this work will possibly serve as a guide to a better understanding of the treatment of putrescent pulps.—*Dental Review.*

SOME EXPERIMENTAL DATA ON THE INLAY CEMENT LINE. By Joseph Head, M.D., D.D.S., Philadelphia. The gold inlay has set the dental world on fire, and therefore any knowledge concerning the cement line cannot but be of especial value.

Some seven or eight years ago I believed that an accurately fitting inlay with a so-called perfect edge and microscopic line of

cement would preserve its integrity in any mouth where there was proper hygienic care. I believed that the mucin of the saliva acting as a plug in a fine line would stop osmosis of any neighboring solvent so as to prevent continued deterioration; while a coarse line would not have any such preservative effect, as here the mucin would be constantly changed and washed away. I also held that the more perfectly the inlay fitted the cavity and the less room there was for cement, the greater would be the security against dislodgment.

Since that time I have had obtruded upon my vision the painful fact that in some mouths a certain per cent of inlays with perfect adaptation will show undoubted signs of discoloration and disintegration at their margins, and that the little shallow labial cavities that allow only a thin cement film for retention are the inlays most likely to drop out. But while I found that in some mouths the finest cement line had dissolved, in other mouths ill-adapted inlays with thick cement margins have lasted for years. However, in spite of all such uncertainty it is now unquestioned, in the great majority of mouths, that well-adapted inlays will be practically permanent. The phosphate and even the silicate cements are insoluble only in some mouths, and then only under certain conditions. The only cement insoluble in all mouths is amalgam.

EXPERIMENTS WITH PHOSPHATE CEMENT FILMS.

Some four years ago I began a series of experiments on the thickness, adhesiveness, strength and solubility of the phosphate cement films. I found that the ordinary Harvard cement gave a film of about 1-500 of an inch in thickness. It had adhesiveness to etched porcelain of about twelve pounds to the 1-16 of a square inch. I further found that by grinding the powder to impalpability the cement line could be reduced to 0.0003 of an inch or even less, and also that by this powdering, the strength and adhesiveness of the cement would be increased almost one-half. I found, too, that an ordinary filling, etched and placed in a smooth cavity, which would be forced out by three pounds' pressure, would withstand twenty-five pounds' pressure when the porcelain and cavity were deeply undercut so that the cement would act as a dowel. But the tests of the solubility of the phos-

phate cements were delayed by innumerable obstacles that had to be first overcome before any reliable data were obtainable, and this explains the three years' delay between the first and the second part of this paper.

In preparation for these tests, pieces of plain glass were etched with hydrofluoric acid, then creamy cement was firmly pressed between them and allowed to set for fifteen minutes. These pieces of glass and cement were then placed in water and at the end of twenty-four hours the glasses fell apart, leaving free cement films. These films were valuable and were used in various solvent solutions to test the resistance of the cement; but what was desired was glass so etched that it would permanently adhere to the cement, in order that the action of solvent fluids could be studied on a cement film protected as it is around the margins of an inlay. Finally, after many experiments, it was found that the fumes of hydrofluoric acid would occasionally form an undercut etch on glass so that wet cement would permanently adhere to it, and in such cases the glass was carefully preserved and cut up into one-fourth inch squares. Agate etched with liquid hydrofluoric acid was found to give permanent hold to wet cement. Thus the corroding action of the various solvents on the cement films could be noted, being discernible through the glass with the dark agate as a background. Where the glass lost its hold on the cement the test was considered inconclusive.

CHEMICALS USED IN THE TEST.

Having solved the problem of making cement stick to glass when immersed in watery fluid, the next question was to decide on the fluids with which to carry on the tests. Experiments were made that consisted of placing free films of cement and tooth enamel in various solvents, such as acetic, valeric, butyric, citric and lactic acids and c. p. ammonia, all of which reagents in a diluted form have been detected in the human saliva. Their effect was primarily tried on natural tooth enamel, because it was considered that fair tests on the solvency of protected cement could only be made with fluids that would not dissolve tooth enamel more rapidly than cement, or, in fact, dissolve, tooth enamel at all, as only such solvents would approximate the conditions found around inlays in the mouth. Natural tooth enamel

with thin unprotected pieces of Harvard cement were tested simultaneously in solutions of various strengths of the solvents just mentioned. For instance, a tooth and cement film when placed in c. p. aqua ammonia showed rapid dissolution of the cement with practically no harm to the tooth enamel. When, however, the ammonia was reduced to 2 per cent or 1 per cent it rendered the cement film only slightly defective in the course of some days, and when a film of cement protected on each side by glass and agate was placed in such a watery solution of ammonia, the power of osmosis seemed incapable of either weakening or dissolving the cement during a period of months. So ammonia was disposed of as a fluid which might cause the cement line of inlays to disappear. When, however, lactic, valeric, butyric and acetic acids were tested, a conclusion concerning the test solution was not so readily reached. C. p. lactice, valeric and butyric acids, being anhydrous, had, as would be expected, no discernible effect on tooth enamel, and little if any on cement, except in the case of valeric acid, which made the free cement film defective. But when these acids as well as acetic and citric acids were tested in watery solutions of from 1 per cent to 1:10,000 or even 1:20,000, the action on tooth enamel was terrific. For instance, 1 per cent watery solutions of lactic, acetic or citric acids would roughen tooth enamel in three minutes; in ten minutes a chalky surface appeared, and in twenty-four hours all enamel was practically eaten away. The valeric and butyric acids in 1 per cent solutions did not seem to practically hurt tooth enamel during twenty-four hours, but at the end of three months they made deep holes into the dentin—a clean scoop, no leathery dentin appearing. These acids, it is true, affected cement films in various degrees, but by comparison with their action on tooth enamel the cement was practically permanent, for it was apparent that if we could find a cement that would last in the mouth as much longer than the enamel as the film of cement outlasted the enamel in these watery solutions, we would have a cement that would in ordinary circumstances last many times a man's lifetime. But these results were preposterous, since in the mouth the enamel remained while the cement dissolved. Proceeding with my experiments with watery solutions and taking lactic acid as a basis, I tested teeth in 1:20,000 lactic acid and water and found in three days that the tooth

enamel was softened to the cut of a lancet, giving a cheesy, colloid shaving. And yet it must be understood that this amount of acid, powerful as it was, was too minute to be perceptible to any known chemical tests. Blue litmus paper dipped in such a solution and dried had just the same color as though it had been dipped in distilled water.

SALIVA VS. WATERY SOLUTIONS.

At last, after carrying on innumerable tests with solutions at blood temperature, I found that the source of error lay in the use of watery solutions; that saliva solutions should be used if results approximating those found in the mouth were to be obtained. I found that saliva has a restraining action on the decalcifying action of acids contained within it, and that the saliva of different persons varies markedly in this restraining power. I also found evidence to indicate that the saliva of an individual might vary in this power from day to day or week to week. For instance, 1:500 lactic acid and water in half an hour will turn tooth enamel white; 1:500 lactic acid and one saliva that I tested, although it turned blue litmus paper brilliantly red and had a sharp acid taste, preserved tooth enamel for days or even weeks unharmed. At other times this same saliva, in solutions of from 1:800 to 1:1,000 would not be able to protect enamel from decalcification for any length of time. It was also discovered that in saliva solutions the cement was less protected from acid decalcifications than was the enamel; it was, too, noted that some salivas were much better protectives for cement than others. For instance, a 1:1,000 solution of lactic acid and one saliva would steadily dissolve cement, while it would not dissolve tooth enamel. A 1:500 lactic acid solution with another saliva would protect both tooth enamel and cement; and as a further interesting fact, cement lasts extremely well in the mouth from which this latter saliva was derived. And so the problem of what fluids to use in these cement-dissolving tests was solved by using saliva solutions of lactic acid.

The procedure was as follows: The above-mentioned ¼-inch squares of etched glass and the etched agate were carefully cleansed and dried. Then finely ground Harvard cement was mixed to a creamy consistence and squeezed between the pieces

of glass and agate for about a minute and the cement allowed to set for fifteen minutes in the air. At the end of that time the edges of the glass were cleansed of cement with a lancet and the protected films placed in a bottle containing the solutions in which they were to be tested. They were then placed in a culture oven where blood temperature was maintained, and observations taken at suitable intervals. The first action of any dissolution of the cement was noticed by the agate slab becoming absolutely clean of the fine cement film that would adhere in spite of scraping to the exposed etched surface. Any further decalcification was clearly visible through disappearance of the cement film beneath the glass. These tests made with saliva solutions were accompanied by control tests of watery solutions of the same strength.

DETAIL OF TESTS.

The first test that I shall report was made with protected film in 1:1,000 solution of saliva and lactic acid and 1:1,000 watery solution of lactic acid. To the saliva were always added a few drops of ether or chloroform to prevent fermentation. In one day there was a perceptible line of decalcification about the glass-covered film in watery solution, which steadily increased. The film in the saliva solution did not show decalcification until the third day. At the end of ten days the film in the watery solution had dissolved 0.035 of an inch all around the edge. It took the film in the saliva solution thirty days to accomplish the same result, this test showing clearly that the saliva reduced the speed of the cement decalcification to one-third of what occurred in a watery solution. Moreover, lactic acid in this solution made a clean decalcification without causing the cement to become rotten and soft. For final observation the glasses were taken off the films, which were tightly adherent to the agate, and the cement beneath was examined. In each instance, what remained was found to be hard and apparently unchanged to the cut of the knife. The films when measured also were about 0.0015 of an inch in thickness, the extra thickness being due to the uneven etching of the glass and agate.

Tests were next made on cement films in solutions of saliva and lactic acid that would not cut tooth enamel. Cement films as above described of about 0.0015 of an inch in thickness were

placed in a saliva with 1:1,000 lactic acid and also in a watery solution of 1:1,000 lactic acid. It might be interesting to note here that lactic acid and saliva 1:2,000 has a decided acid taste. The patient, however, probably cannot perceive this any more than he can note bad breath. At the end of thirty days the film in the watery solution of 1:1,000 lactic acid had dissolved to a distance of one-sixteenth of an inch from the edge of the glass, while the protected film in the 1:1,000 lactic acid and saliva solution showed no signs of dissolution at all.

Protected films placed in 1:500 lactic acid and one saliva in thirty days showed slight but perceptible dissolution around the edge of the glass; while a similar test made with another saliva with a solution of 1:500 lactic acid showed no perceptible deterioration in the cement film at all. In fact, one of the cement films kept in a 1:500 lactic acid solution with the latter saliva for six months just began to show signs of deterioration at the glass edge. Thus, some salivas unquestionably are able to far better preserve cement and enamel against acids of a certain strength than are others.

Numerous tests with acid solutions made from the salivas of various patients conclusively prove that salivas vary in their relative power of restraining acid decalcification both of tooth structure and cement.

THE CEMENT FILM NO SAFE PROTECTION.

Another test of interest was the following: A protected cement film had been left in a 1:1,000 solution of lactic acid and saliva for two months during the summer. When I returned, the solution had fermented. I took out the protected film and found it apparently unharmed. I renewed the solution with 1:300 lactic acid and saliva. At the end of twenty-four hours I was astonished to find the cement film dissolved one-sixteenth of an inch from the edge of the glass. A further immersion in the 1:300 lactic acid and saliva solution made only the slow progress one would ordinarily expect. At the end of ten days the glass was prized off the cement, which was very adherent and apparently unsoftened to the cut of the knife. This test seemed to show that the edge of the cement film had been rendered defective during the summer, but the 1:1,000 lactic acid and saliva could not en-

tirely dissolve it, while a solution of 1:300 lactic acid and saliva later readily dissolved the rotten portion in a few hours, while the gradual dissolution of the normal cement went on with the ordinary speed. Tests were then made to show the relative speed with which a thick and a thin cement film would dissolve in a given solution.

Protected films 1/700 of an inch thick, as above described, were used for thin films, and for the thick, films of about 1/250 of an inch. The thick films were made by squeezing the cement between the agate and glass held apart with layers of a narrow strip of platinum foil 1/1,000 of an inch in thickness folded together. To my astonishment the thin film, 1/700 of an inch, dissolved in watery solutions three times as fast as the 1/250 of an inch film; while in saliva solutions the thin film of 1/700 of an inch dissolved in a 1:500 lactic acid solution with saliva twice as fast. In fact, during a period of two months the thin film had dissolved 1/16 of an inch from the edge, while the 1/250 of an inch film in the same time had dissolved only 1/32 of an inch. The thick and thin films tried in 1:1,000 lactic acid and saliva had not dissolved at all during the same time, not even a little film of free cement that I had not cleaned from the etched agate. This experiment, many times repeated, was a stumbling-block, as up to that time I had thought a very fine joint to be a protection against decalcification of the cement around the edge of an inlay. I even took moss fiber gold and cemented it with great pressure between the glass and agate slabs, trimming the edges clean and flush with a sharp lancet. I did this to get the finest possible adaptation and the thinnest film of cement, thinking that as an inlay would be kept from its position by the largest grain of cement, with the moss fiber gold the apposition might be said to be represented by the smallest cement layer possible, since the large grains of powder would be imbedded in soft gold. But these tests only reaffirmed the fact that a thin layer of cement will dissolve more rapidly than a thick layer under similar conditions. And yet, this, when we come to think it over, is only natural—the less cement there is to be dissolved by a solvent, the more rapidly it will disappear.

And so after all that has been said and done, the fine cement film of an inlay is no protection against disintegration; it only

looks better, especially if the margins of the inlay tend to discolor. This explains why the old Bing gold inlay lasts so well, consisting as it does of a thin gold shell and pin cemented on to a cavity. Badly fitting though the edges have been, I have seen Bing inlays last for years and do not remember ever having been able to pull one out.

CONCLUDING REMARKS.

These tests lead to the following conclusions: (1) In saliva solutions of acid, cement ordinarily dissolves more readily than enamel, and (2) some salivas are able to protect cement from decalcification and some salivas are not.

Where decalcification occurs as the only factor, a fine line of cement will dissolve more rapidly than a coarse line of cement; but where friction and the jamming of the carbohydrates into a coarse line by mastication occurs, undoubtedly the cement in a coarse line will disappear more rapidly than in a fine line. But since a fine line of cement looks better than a coarse line, the extreme edges of the inlay should be as perfectly adapted as possible; but just back of the edges there should be a large thick body of cement that will control for years any slight solvent that may chance to get past the close-fitting edges. In plain words, the inlays should fit perfectly and then care should be taken to undercut both cavity and inlay so that the cement may act as a dowel and as a neutralizer of penetrating acid.

When the gold inlay is on the grinding surface, mastication will no doubt often swage the edges of the metal into apposition to the enamel as dissolution of the cement takes place. But what I have often said before I now repeat: The best inlay consists of a gold filling set in cement where the edges have been finally cleaned of cement and fresh gold hammered or burnished into accurate apposition to the margins.

I finally chose lactic acid for my testing solution, not because acetic, citric, butyric and valeric acids might not also attack the cement in the mouth, but because its action in my tests more nearly represented the kind of decalcification which I had noted in the mouth. Valeric and butyric acids slightly attack Harvard cement, but acetic and citric acids do it quite vigorously, and I have often wondered if these acids were not responsible for the

dark cement line that sometimes appears around inlays in the front teeth, these acids being not products of fermentation but ingredients of food.

I did not speak of the effect of acid calcium phosphate or acid sodium phosphate because these, as would be expected, do not attack cement, however much they may attack tooth enamel.

Before closing, let me say that I am putting in more inlays now than I ever did. I believe in the future of the inlay more than ever, and I hope some time to be able to find some means by which the saliva may be modified so that its power of resisting decalcification may be increased. Whether potassium sulfocyanate or sodium and calcium phosphates are to be credited with this acid-restraining power, or whether this power is purely a property of saliva as a living fluid, will in time probably be demonstrated.—*Dental Cosmos.*

THE EVIDENCE OF DESIGN. By Charles Channing Allen, D.D.S., Kansas City, Mo. When a work is executed with the concepts of beauty, utility and economy in their proper proportion, that work bears with it as its own individual characteristic the evidence of design. This is its passport; its credential; its hall mark; its justification. In such character it shows whether it is the legitimate child of orderly intelligence, or the bastard of bungling incompetency. If it was fathered by an understanding of the requirements and a skill sufficient for their execution, then it must appeal to the mind as answering the requirements of esthetics —the beautiful. Without digressing into the maze of esthetic philosophy, we may avail ourselves of certain explanatory formulæ bearing upon the relationship of beauty and design, and beauty as a proof of design. In the realm of esthetics, as in all important phases of metaphysics, we are compelled to refer to Plato and Aristotle, although, in giving consideration to design over mere beauty, we cannot accept their dictum that beauty is without definite utility. Beauty carries with it more of the evidence of design than mere utility, for the esthetic or beautiful appeals to one immediately, and does not require a systematic proof along the recognized lines of logic, but establishes itself in the mind of the beholder at once, without proof. Utility alone, as an ultimate end, executed without embellishment, may be, and usually is, vague in

expressing its reason for existence and must be studied and its purpose analyzed, often laboriously and at tiresome length.

No profession has more use for the esthetic and beautiful than the profession of dentistry; for an artistic restoration is a very large part of our obligation to our patients. A filling may be inserted which abounds in ugly angles and incongruous curves that will answer all the purposes required of it for mastication and preservation, but at the same time be such a positive disfigurement and a consequent detriment to the patient, as to well nigh offset its usefulness. This same filling, with margins trimmed according to some definite system of mathematical curves, may carry with it such evidence of design and establish such sympathetic relationship between the maker and beholder, that it becomes a thing of beauty and esthetic embellishment. Thus to the mere usefulness of preservation and mastication is added the usefulness of the cosmetic, and we bring to our patient, instead of embarrassment, a sense of presentableness. It is not sufficient in the execution of a piece of dental work bearing full evidence of design, that one should use certain curves and angles, but these curves and angles must be assembled according to the laws of artistic combination, so that they will suggest to the mind of the beholder such continuations as will stimulate the interest and not satisfy at a single glance. This is the inspiring element of method in all art.

Take the matter of proximal fillings in central incisors. The marginal line on the labial surface which presents itself to the eye should not appear to be the arc of a simple circle, because, instinctively, the arc of a circle carries with it the suggestion of the completed simple figure. While it cannot be denied that there is design in a circle, yet the more complete design of a different curve, one with an ever-changing radius, is more pleasing to the eye. A filling inserted with cycloidal marginal lines gives evidence of a fuller consideration of the problem involved than is suggested by the arc of a simple circle. Again, if two fillings are opposite in central incisors, the marginal outlines of both should be curves of the same mathematical value. These curves need not be of the same size, but if they are given the same characteristics, they produce the effect of symmetry, and if the curves used are cycliodal, the effect of the two fillings as seen together from a little distance is not that of a circular spot of gold. A circular filling on the

surface of a tooth never is attractive or artistic for the reasons stated, and this form should be avoided entirely. For similar reasons, a cervical filling should never have the opposite margins parallel, but the lower margin, while it should not be straight, should be straighter than the upper. Of course, in that class of fillings where the color and texture of the tooth is sought to be imitated, the marginal effect is of less importance. For if the work is well done, it is assumed that the margins will be inconconspicuous, and in this case the best evidence of design would be making these margins studiedly irregular, so that any slight variation of color between the tooth and the filling would be obscured by the very lack of conventional form.

The skilful architect carefully avoids forms too obvious, but all his lines carry with them a suggestion of ultimate possibilities that fire the imagination of the beholder and establish a community of sympathy between the creating and the perceiving minds, and sympathy is the silent language of the soul. Following this principle of method, the architect uses few cubes, circles or spheres, because such forms are complete in themselves and appeal no further to the imagination. Not so with the parabolic curve or the cycloidal curve.

All the beautiful scrolls, frets, and carved capitals avoid the circle, the curves used being those of progressive change. Nature herself has scant use for the circle. No tree limbs grow in arcs; the reeds and grasses do not bend in arcs; the rivers do not flow in arcs, and even planets do not move in circles. The laws governing artistic combination are not susceptible of easy definition, and probably could not be stated in definite formula, as can so many of the natural laws. But men instinctively understand them, and those who understand them well belong to the class we call artistic. Those transcendent in this instinct are the geniuses in the arts; they are the reflectors of harmony, the interpreters of the esthetic. That men large in this instinct lived in the very early history of the race is shown by the splendid ruins of some of the oldest temples, which in their majestic decay exhibit marvelous concepts of harmonious combination in line, in pillar, capital and scroll, and today our artists seek them as the shrines of grace and beauty. The artistic masters of all the ages have paid tribute to these monuments. They have stood within the charm of their

inspiring influence. Time has defied improvement and they have remained alone in their majesty, perfect because of their fidelity to the laws of harmonious combination.

An interesting and pertinent example of continuously changing curves is the form of the question mark, which is the most beautiful symbol in the printer's font. Contrast the question mark with the letter O or the angular and uncouth K. The question mark fulfills the artistic requirements and suggests interminable forms. The letter O is complete, simple, and uninspiring. The lines of the letter K could only be extended to unvarying and monotonous lengths, but the question mark is made up of a multitude of changing curves, each a part of an incompleted form which inspires the attentive mind to an infinity of speculation. And it is fitting that this beautiful symbol should stand at the very portal of knowledge, for the first step toward the understanding is always the question:—Why?

The imagination may follow the extension of the parabolic curve throughout its duration, and as long as the imagination does follow it we have the interest of a continuous change to hold the attention. The figure may never be completed, yet no figure in all the geometrical arrangement carries with it more evidence of design.

The starry heavens, most sublime of all natural phenomena, most magnificent of all pictures, most fascinating of all scenes, presents to the awed mind of man no obvious systematic arrangement, but a continuous change, and in this change the most impressive of all our conceptions of order. These wandering worlds which stud the firmament pursue their appointed ways without conflict or argument, each in a pathway mapped in limitless space, in an orbit ever changing, but ever revealing the evidence of Omnipotent design.

To him who has the mind to read, there is no natural order of events without apparent intentional arrangement. In man's relationship to external nature, all things bear a meaning, and if he could but comprehend the hints so numerously set forth, they would open to him the pages of the future and enable him to predict unerringly the course of events.

The whole burden of conveying understanding is not placed upon the creator of any plan, scheme, system or device, but there

is also an obligation upon the perceiver. A design may be obvious to one mind and obscure to another. It is just as the perceiving mind chances to be dull, stupid and incompetent, or keen, alert and cultivated. There are varying degrees of designs, just as there are varying minds to perceive them. If this were not true, there would be no incentive to study and mental cultivation. For the mind is susceptible of cultivation as design continues to unfold its more complex forms, and nature only gives up her secrets after the most persistent siege, then tantalizes man with their obvious simplicity. This in itself is an evidence of design.

A mind may see mere beauty in a negative sense; that is, in the absence of the unharmonious, uncouth and incongruous; but that beauty may convey no message, may appeal to no emotion. This is purely an intellectual perception and is devoid of soul, sympathy or heart, and is the most intensely selfish of all mental manifestations. The keen, incisive, cold and logical intellect, unleavened by the various human passions, good or bad, is a mind incapable of seeing that there is intention and plan in many of the various phenomena of daily living. Mitchell says: "In substituting a mere understanding for this esthetic and sympathetic understanding, we commit a variety of errors. In the first place, we judge by standards of taste and conduct which may be perfectly valid standards, but if we have not learnt the spirit from which their value is derived, we use them in the letter, and are bound to the form of stupidity called intellectualism."

The evidence of design may not unfold itself to the mind in any single phenomena, but when two or more plans, events or phenomena are brought into their proper relationship, the whole scheme may be unfolded and discover to the mind not only the well-planned intent of the whole system, but also the latent beauty of each component part. Unorderly piles of stone, lumber, brick and other building materials reveal no beauty whatever, but when these rough materials are assembled by the artisan and artist, according to the laws of architectural usage, they become beautiful structures, structures which awaken all the finer senses of appreciation. The detached petal of a rose conveys to the mind unfamiliar with that flower no particular suggestion of beauty apart from itself, but when we see the full blown rose we at once per-

ceive the beauty of the petal's harmonious relationship to the other members of that flower.

So, from the fragmentary revelations permitted us, we may not read the mystery of life. Through our disconnected experiences, we may fail to see the silken thread of order. We are brought into the world helpless and naked. We are guided through the apprenticeship of youth and are appointed to our manhood's tasks. We are led from the scene and are confronted with the incident of death. Is there a plan in this? If not, how stale and profitless it is. How vain and tasteless is existence. Since men have counted time, the mind has rebelled against the idea of an unplanned universe. Through all recorded time has man sought to rend the veil and fretted at his limitations. Is there a man who does not in his inmost heart believe that when we stand in the full light, radiant with knowledge, we shall see the completed design in all its transcendent glory?

"When the soul,
Advancing ever to the source of light
And all perfection, lives, adores, and reigns
In cloudless knowledge, purity and bliss."

—*Western Dental Journal.*

HOW CAN WE IMPROVE OUR NOMENCLATURE? By S. H. Guilford, A.M., D.D.S., Ph.D., Philadelphia, Pa. No art or science can be considered entirely satisfactory to its followers unless it possesses a nomenclature at least approximately exact and in harmony with philologic requirements.

Indeed, exactness in its methods is a prime requisite for a true art or a true science, and if its methods need to be exact and true to fundamental principles, the terms in which those methods are expressed need to be equally exact in order to be consistent. Ambiguity of expression cannot harmonize with scientific procedure. For this reason many departments of human endeavor which have made steady progress toward perfection, after having been satisfied a while with a multitude of terms which, while incorrect, have served a temporary purpose, have in time come to a point where revision of their nomenclature became a necessity.

In come of the lesser arts many of the improvements in method

or manipulation have been conceived by the workmen, whose meager early education has not provided them with a large vocabulary, and who, in consequence, have given to new devices or processes names which bear no real relation to them. It is in this way that most of the incongruous and incorrect terms have crept into use in the various arts, and they are not eventually weeded out or supplanted by better ones until a long time has elapsed; and usually some of them have in time become so fixed by usage that they are never entirely eliminated.

We only need examine the terminology of our profession to become convinced that it has proved no exception to the rule. As new terms are constantly being introduced, often by those of marked ability along practical lines but with no idea of philologic propriety, the sooner the terminology of our calling is revised and placed upon a scientific basis the better the result obtained will be. The task to be performed in accomplishing this result is not an easy one, nor can it be accomplished very rapidly, because we are all creatures of prejudice and are slow to give up that to which we have become accustomed, and which has been taking the place of something that is strange, even though it be better.

History of Attempted Revision—The Commission on Nomenclature.—The first serious attempt at revising and improving our terminology was made by Dr. Black, and the results of his labor were embodied in a paper read before the Columbian Dental Congress in 1893. Like all other work done by him, his report was extensive, complete and most valuable. It served to call the attention of the profession to the great necessity of a revised nomenclature, and started a movement which will some day culminate in most happy results.

Since that time, work along the same lines has been done by special committees appointed by the National Dental Association and by the National Association of Dental Faculties, while more recently the matter has been taken up by the Institute of Dental Pedagogics, to whom the work more properly belongs. In the last instance the labor has been assigned to a permanent commission which will carry it on to what we hope will be a satisfactory termination. This commission has made two annual reports covering the subjects of operative and prosthetic dentistry, and it is

proposed to annually report upon one branch of dental science until all branches have been included. The work is a monumental one, but those engaged in it are both capable and enthusiastic, and it is safe to predict that the work will be well done.

The most difficult problem encountered at the outset by the commission was to decide upon the basis on which the superstructure should be built. The dead languages, Latin and Greek, on account of their unchangeableness, have served as foundations for the nomenclature of the older sciences. Botany and zoölogy have built their terms almost exclusively upon Latin bases. Those of biology are principally of Greek origin. Electricity has employed both Latin and Greek terms, while medicine and surgery have terms some Greek, some Latin and others a combination of the two. The word "medicine" itself is of Latin origin, while "surgery" comes from the Greek.

A terminology that is intended to be thoroughly international or universal in character could have no other basis than that of one or both of the dead languages, for besides their fixedness they are the only ones understood by virtually all civilized nations; and yet to so revise our nomenclature as to place it upon a strictly Latin or Greek foundation would involve such radical changes as to defeat the very object had in view.

The medical sciences have recently undertaken such a revision of their nomenclature through an international commission, and while their work has been well done and their results published in permanent form, it remains to be seen whether its adoption will be quite general or easily accomplished.

The Dental Commission on Nomenclature decided in the beginning that such radical action would not be wise, and while they will give preference to terms formed from Latin or Greek roots, where such are available and not too complicated, they very wisely decided to retain many terms of uncertain parentage that have become established through long use. A few such terms will not materially mar the work as a whole.

As far as terms of recent introduction are concerned the Dental Commission will give decided preference to those based upon a classic or scientific foundation. Since the object of the terms is to intelligently convey ideas, those that serve this purpose best

are the ones to be selected. Above all, ambiguity is to be avoided, for whenever a word is variously used to convey different ideas in different relationships it is not, and cannot be, exact and definite.

Illustrations of Unsettled and Erroneous Nomenclature.—As an illustration, in our terminology we have the terms *articulation* and *occlusion,* which are often used interchangeably. Although neither word exactly expresses the condition we wish to describe, the commission has decided upon the term occlusion as the better one, because it has but one meaning, while articulation has several. So, also, with the terms *absorption* and *resorption.* The former is the older word, but, since it does not correctly describe the physiologic process and has other meanings, it has had to give way to the latter one, which is exact and has but one meaning. Again, the term *exostosis* (borrowed from medicine) was long used to describe an enlargement of the root of a tooth, but it was not correct, and has been replaced by the term *cementosis,* which exactly describes the condition. In the same way *periosteum* has been superseded by *pericementum,* while another compound term, *alveolo-dental membrane,* which was designed by its originator to more exactly express the location of this unique tissue, is not only needlessly cumbersome but manifestly incorrect, because instead of being attached to a tooth it is attached only to the root, and in particular to but one portion of the root, the cementum. *Pericementum* is a far better term, for it is simpler and more exact. We sometimes notice in journals the term "ulcerated tooth," but its incorrectness is apparent when we consider that an ulcer is defined as "an *open* sore in soft tissues with secretion of pus," while an abscess is a "localized collection of pus in a cavity." We often meet with an alveolar abscess, but never with an ulcerated tooth or root.

We have been accustomed to speak of the *antrum* of Highmore or maxillary *antrum,* and of the frontal *sinus,* and yet both cavities are anatomically similar. *Antrum* would seem to be the better term, as its definition is "a chamber or cavity in a bone," while *sinus* has two meanings—(1) "a recess, cavity, or hollow space" and (2) "an opening leading to an abscess."

We frequently notice three adjectives used interchangeably—"calcific," "calcareous," and "calcic." They are all three derived

from the same Latin root, *calx* (lime), but are not synonymous. "Calcific" means forming lime, as in the calcification of cartilage, but "calcareous" and "calcic" mean containing lime. The term calcareous is commonly applied to minerals, as calcareous earth, calcareous rock, etc., while calcic is largely restricted to such fluids of the body as contain and carry lime, as the blood and the saliva.

"Bibulous" and "absorbent," as dental terms, also require differentiation, the former too often applying to individuals under certain conditions, while the latter denotes only a physiologic or physical property. *Absorbent* cotton or paper is therefore a better term than bibulous.

Our supply catalogues speak of cotton "pliers," and gold "pliers," when they mean tweezers. Pliers are composed of two parts working on a joint, while tweezers, as we know, have no joint.

The term "air-chamber" as applied to dentures is contradictory in itself, for the chamber is supposed to be without air. *Vacuum chamber* is the proper term.

I hope to be pardoned for introducing so many examples of incorrect terms, with most of which you are entirely familiar, but I have done so in order to emphasize the importance of a revision of our nomenclature.

It is as easy to use correct terms as incorrect ones, and certainly far better. If all of us will carefully study the reports of the Commission on Nomenclature as they will appear from time to time in the journals, and familiarize ourselves with the terms proposed there, and if, further, the teachers in our schools will adopt the words approved of, and rigidly discard those that are condemned, the question of "How can we improve our nomenclature?" will soon be satisfactorily solved.—*Dental Cosmos.*

THE URIC ACID PROBLEM AS RELATED TO PERICEMENTAL INFLAMMATIONS. By Julio Endelman, D.D.S., Philadelphia, Pa. It is the purpose of the writer to deal with certain phases of the etiology, pathology and treatment of that form of pyorrhea alveolaris which has been variously designated as systemic pyorrhea, gouty pyorrhea, phagedenic pericementitis and pyo-destructive pericementitis, and incidentally to allude to a form

of senile pericemental atrophy which has but one condition in common with the true form of the disease under consideration, inasmuch as both may lead eventually to the loss of the affected organs.

It would be decidedly superfluous to refer, before this audience, to the reasons upon which is based the generally accepted classification of pyorrhea into systemic and local. Any controversy that may have existed in the past between the adherents to the theory of the dual etiology and those who attribute the disease to purely local causes can be satisfactorily disposed of at the present time, in view of the painstaking and efficient investigations by men whose names are household words wherever modern dentistry is firmly implanted.

While it may be taken for granted that we are all more or less in accord in regard to the fundamental causative factors of pyorrhea alveolaris, the same cannot be said of the series of initial phenomena responsible for the onset of the inflammatory disturbance in either the diffuse form of pyo-pericementitis, *i. e.,* pyorrhea alveolaris, or the circumscribed form of pyo-pericementitis, *i. e.,* pericemental abscess.

Initial Phenomena of Pericemental Inflammations.—The study of inflammatory processes of bacterial origin in any region of the body involves a consideration of the nature of the tissues involved, their circulation—blood and lymph—and their nerve supply, the exciting factor and the anatomic changes induced by it. In the case of the particular area with which we are concerned it is not necessary to describe its anatomic characteristics, macro- or microscopic, blood supply or nerve distribution, as these are matters of common knowledge with the average practitioner, although it may not be altogether out of place to consider for a few minutes the much-discussed question as to whether or not lymphatic tissue is present in the pericementum, for such epithelial structures as have been discovered in that membrane doubtless are an important, though at times a passive, factor in the progress of the inflammatory process. The writer has elsewhere expressed his views concerning the structures which Dr. G. V. Black has described as glandular tissues, and considers those views sufficiently justified to warrant him in reiterating them by referring again to

the conclusive studies of Malassez of Paris, who has doubtless definitely settled the exact nature of the groups of cells which have been repeatedly referred to as the glands of the pericementum. Malassez, after exhaustive histologic investigations, came to the conclusion that these structures were not in a sense normal constituents of the pericementum, but groups of epithelial cells which had become detached from the enamel organ and entangled in the network of pericemental fibers. Consequently they may be viewed in the light of abnormal structures, and these not infrequently give rise to extremely annoying and disfiguring cyst formations simulating either apical or pericemental abscess. As it will be necessary to refer again to these structures in connection with the etiology of pyorrhea, further reference to them at this time is unnecessary.

The systemic form of pyorrhea is characterized by the course of the disease, which, in contradistinction to local pyorrhea, originates somewhere in the apical third of the tooth-root and travels or spreads toward the gum margin. It has been a rather difficult problem to account for the development of a focus of inflammation in that portion of the pericemental membrane, rather than at some point nearer to the cervical margin. Thanks, however, to the studies of Kirk, Peirce and others, we are able to-day to account in what would seem a satisfactory manner for several of the links in the heretofore incomplete chain of pathologic evidence.

The first phenomenon in the history of the development of systemic pyorrhea alveolaris of gouty origin which should engage our attention is the deposition of the uratic salts upon the apical surface of the tooth-root. It is evident that certain changes occur in that portion of the root which do not take place in the remainder of the organ, for if this were not so how can we account for the fact that such deposits are invariably found near the apical portion of the root rather than at any other point between the pericemental membrane and the root?

The theory which the author ventures to offer in explanation of this phase of the etiology of the disease under consideration embodies the result of several years of observation and, although he is not as yet prepared to assert that it is applicable in all instances, still he believes that in the large majority of cases it satis-

factorily explains a phenomenon to which but little attention has been given in the past, notwithstanding that it directly bears both on the prophylaxis and the treatment of this malady.

By referring to the writings of Peirce it will be found that, in his opinion, "the deposition of the gouty material is determined by an abnormal condition of the membrane, a condition of impaired vitality, the result of some mechanical or other irritation which predisposes it to the infiltration," and that "the views of Ebstein concerning the deposition of uratic salts have found general acceptance." The first part of this explanation is incomplete, because it fails to account in a satisfactory manner for the presence of the uratic deposits upon the apical areas of the root; with the second part, notwithstanding its distinguished source, we are compelled to disagree, in view of studies and observations leading rather to the conclusion that while Ebstein's theory may be accepted as true in some cases in which pyorrhea is indirectly brought about by nutritional disorders in persons suffering from syphilis, arterio-sclerosis and other vascular disorders, it does not hold good in the class of cases under consideration.

Pyorrhea Not All of "Gouty" Origin.—We consider it necessary to clearly state at this point that we disagree with the views held by some to the effect that all forms of systemic pyorrhea are of gouty origin. The evidence of clinical observation strongly points to many other etiologic causative factors and consequently the views here enunciated are intended to apply exclusively to that form of pyorrhea which develops in individuals of the gouty diathesis and not to such forms of pericemental inflammations as manifest themselves as complications of renal and pulmonary disturbances and to a form of loosening of the teeth caused by circulatory disturbances, arterio-sclerosis, atheroma, etc. In the case of the latter group of diseases the loss of the teeth is the result of true atrophy of the pericemental membrane, due to the fact that the pericementum being an end organ, its nutrition is greatly impaired by abnormal changes in the circulatory apparatus even before they reach the stage at which they induce manifestations of a more serious nature in any of the vital organs.

It may be said in a general way that the "gouty diathesis," or

as it is better described by French writers, the diathesis of arthritism, is a condition characterized by the presence in the blood and tissues of an excess of the products of the incomplete oxidation of protein bodies, in the shape of xanthin bases, amido acid compounds and uric acid. Normally the products of the breaking down of the proteids, such as uric acid (in small quantities) and urea, are taken care of by the kidneys and eliminated without disturbing the functional equilibrium. Under conditions of increased intake of nitrogenous foodstuffs or of inability of the liver to carry the process of oxidation of the nitrogenous debris to the stage of urea, the xanthin bases, amido acids and uric acid remain in the circulation and give rise to the series of disturbances which are collectively designated as belonging to the uric acid diathesis. It is by no means an easy problem to reach any sort of satisfactory conclusion based upon chemical and pathologic facts concerning the action of the incompletely oxidized products of proteid metabolism. It is known that some of the antecedents of uric acid, such as xanthin, hypo-xanthin and guanin, are non-poisonous, and others, such as hetero-xanthin, para-xanthin and adenin, are poisonous; that uric acid is insoluble; that its salts are more or less soluble in an alkaline medium; that urea is extremely soluble and that it is readily abstracted by the kidneys and excreted as one of the constituents of the urine. But, although, as has just been said, from a chemical point of view we are in the dark regarding the pathologic influence of these compounds, from a clinical aspect much of importance has already been most satisfactorily explained, mainly by Haig of London, who, in a convincing series of papers and in his more complete work published in 1894, has clearly pointed out the role of uric acid in disease. This author, following a series of experiments upon himself, has proved that when the ratio of uric acid to urea is greater than the average ratio for healthy individuals, serious disturbances follow. From these experiments, together with the data obtainable up to the present time from other sources, it may be reasoned that uric acid is *per se* poisonous, and that either uncombined or in combination with the bases of sodium, calcium, magnesium or ammonium, is of such a low degree of osmotic pressure as to favor its retention in the blood and tissues

and markedly retard its passage into the renal structures, which readily accomplish its elimination when under healthy conditions it is produced in very small quantity. Urea, on the other hand, is a very soluble compound which easily passes through the renal capillaries and is thus at once eliminated in the urine. Furthermore, the solubility and osmotic factors are not the only ones to be considered in this connection, for the mechanical irritation induced by the mere presence of these bodies is bound to bring about abnormal changes in the tissues with which they come into contact, and particularly in the more sensitive nervous structures. The failure of the products of proteid metabolism to reach the urea stage is generally attributed to insufficient oxidation and hence the gouty diathesis or arthritism is at times also designated as the diathesis of suboxidation.

It is probable, however, that the oxidation of the forerunners of uric acid as well as that of uric itself into urea is not a direct process, that is to say, one in which the oxygen of the atmosphere directly oxidizes and transforms uric acid into urea, for as has been pointed out by Bunge, in birds, which of all animals have the most active respiration, the bulk of the nitrogen leaves the body as uric acid. Furthermore, if the conversion of uric acid into urea were the result of a process of direct oxidation, we should find the excretion of urea greatly decreased and that of uric acid greatly increased in diseases of the respiratory tract, but against this it has been found that the relations of uric acid to urea in these affections vary within the same limits as they do in the case of healthy people. It would, therefore, be more reasonable to assume that oxygen is indirectly a factor in the production of urea by its stimulating action upon the hepatic structures, the liver being, so far as is known at the present time, the organ in which the chemical transformation of uric acid into urea takes place.

Let us at this point recapitulate our remarks on the etiology of gout in order that we may be able to clearly point out the changes which may take place in the structures with which we are mainly concerned: (1. The gouty diathesis is characterized by the incomplete metabolism of nitrogenous foodstuffs or of the stored proteids in the body. (2) This incomplete metabolism

may reach the stage of uric acid formation or may stop at some point in the chemical process prior to the appearance of uric acid. (3) Some of the forerunners of uric acid and uric acid itself are protoplasmic poisons. (4) Practically all of the uric acid formed circulates in the blood in the form of salts of sodium, calcium, magnesium and ammonium. (5) The liver is probably the organ in which uric acid is transformed into urea. Hepatic stimulation is, therefore, of the greatest importance in the treatment of gout. (6) Uric acid is retained in the circulation by reason of its low degree of osmotic pressure, the opposite of what occurs in the case of urea.

Relation of the Deposition of Uratic Salts to the Alkalinity of the Blood.—It is a well-known fact that the salts of uric acid are maintained in solution in the blood by virtue of the alkalinity of that fluid and that they are precipitated by acids, or at least by substances of a lower degree of alkalinity than that of the solvent in which they are present. Scheele, as early as 1776, had discovered the fact that urinary concretions are dissolved by alkalis and precipitated by acids. In a previous paper, the author has offered the suggestion that the application of these known facts to the conditions present in the pericementum could be made to explain the phenomenon of the formation of sanguinary or uratic deposits upon the roots of teeth. This suggestion was embodied in a paper entitled "Uratic Deposits Upon the Roots of Teeth," published at page 935 of the Dental Cosmos for August, 1905, and since then additional studies and observations carried on for the purpose of revising the writer's earlier views have enabled him to satisfactorily dispose of the element of doubt in his previous investigations and hence to confirm the etiologic factor about to be related.

If, as has been previously pointed out, and as does occur, uratic salts are precipitated by preference at some point in the apical region of the tooth-root, it necessarily follows that there the fluids and structures must be of a degree of alkalinity less than that of the blood. This is the special point upon which I must request your thoughtful consideration, it being without doubt of the greatest importance in its bearing upon the prophylaxis and treatment of the disease under consideration. Several years ago, in the

course of a detailed study of pyorrhea alveolaris, this phase of its etiology was forcefully brought to the writer's attention by reason of a conspicuous lack of reference in our literature to this initial phenomenon in the evolution of pyorrhea, notwithstanding that the method of treatment which of recent years has been strongly advocated, and which in the main consists in the splinting of the affected teeth, is virtually based upon the phenomena which, with their interpretation, it is now my privilege to submit for your consideration.

Ordinarily, that is to say, under conditions of rest or slight activity, all articulations, their ligaments, synovial membranes, articulating cartilages and the fluids in which they are bathed are of an alkaline reaction; on the other hand, under conditions of activity the reaction at once changes to one of less marked alkalinity—relative acidity—or in extreme cases to one of actual acidity. These reactions of the tissues in question constitute a physiologic fact which is frequently demonstrated to students in medical and dental schools in the course of their studies on general physiology, and requires no argument to substantiate its trustworthiness. Should anyone hesitate about accepting this fact, a comparatively simple experiment will forever convince him that the reactions are as above stated. After preparing a frog for experimentation by first severing the spinal cord at its junction with the encephalon, expose the middle articulation of either of the hindlegs and test the reaction with litmus paper. It will be found decidedly alkaline. Now subject the exposed tissues to a series of active contractions and again test their reaction. It will be found to be markedly acid.

These changes in reaction no doubt also occur in the case of the alveolo-dental articulation. Allow me in this connection to recall to your minds that the pericemental membrane is composed of bundles of fibrous connective tissue, which upon being subjected to abnormal degrees of activity undergo a chemical disintegration ending, it is believed, in the production of lactic acid. Collagen, the principal element in fibrous tissue, when hydrated is converted into gelatin, which upon further disintegration is found to be composed of proteids; these may be detected by any one of the known proteic reactions. Proteids upon breaking down during activity

may give rise to sarco-lactic or the plain lactic acid among other compounds. It is submitted that the above facts satisfactorily explain the conditions which take place in the apical region of the root, and which, in the presence of pus-producing organisms, lead to the development of a tophus abscess. As an additional argument of the theory under consideration, it may be stated that the frequency of gouty deposits upon the metatarso-phalangeal articulation of the great toe is in the writer's opinion due to the fact that in the act of walking a great proportion of the body's weight is thrown upon that part of the foot. The consequence of this strain results in the formation of acid substances, and so renders that particular region a suitable field for the precipitation of uratic salts.

It will be seen, therefore, that the initial phenomenon responsible for the deposition of uratic salts in any articulation is the result of a change in the reaction of the tissues brought about by the breaking down of proteid bodies in the course of physical activity and the consequent formation of acid substances. In the case of the alveolo-dental articulation, whenever a tooth is subjected to a degree of activity greater than normal, the catabolism of the cellular elements of the pericemental membrane results in the production of acid substances which lessen the alkalinity of the membrane, particularly at the point at which the greatest degree of stress is felt. In single-rooted teeth the uratic deposits are found as a rule in or near the apical region of the root, and in multi-rooted teeth either upon one of the roots in a location corresponding to that upon which the uratic salts are deposited in incisors, cuspids and bicuspids, or else upon the bifurcation area. These areas of uratic precipitation are accounted for by the fact that in the presence of the slightest degree of over-activity the locations referred to are the ones which sustain the greatest degree of stress, for reasons exclusively physical and based upon laws of mechanics, the discussion of which would be out of place here. Teeth are very often, in fact more often than is generally believed, subjected to degrees of stress greater than normal. A slight deviation from the position which a given tooth should occupy in the arch is sufficient to cause that tooth to perform an amount of work greater than its normal share should be. This

leads to over-activity, excessive oxidation, decrease of alkalinity, and probably to the formation of lactic acid through the breaking down of the complex proteic molecules of the pericemental membrane, and finally to the precipitation upon the areas of greater stress of the uratic salts held in solution in the blood by virtue of its alkalinity.

The author considers that in a large number of instances of pyorrhea alveolaris, the main etiologic causative factor is the relative or actual acidity of some portion of the pericemental membrane. This is then followed by the precipitation of uric acid salts, which, acting as an irritant, convert that pericemental area into a suitable field for the development of pyogenic organisms. The deposited urates create a *locus minoris resistentiæ,* and together with pyogenic germs are responsible for the formation of pus, which, being of an alkalinity greater than that of the blood, causes a precipitation of the calcium phosphates that are frequently found to be a component of the gouty deposit.

Factors Other Than the Gouty Deposit—The Bacteria of Pericemental Inflammations.—Having thus accounted for the presence of concretions upon the root surface, it becomes a comparatively easy task to explain the further series of phenomena which characterize the evolution of the destructive form of pericementitis under discussion. The presence of the gouty deposit must be considered as the irritant which, by disturbing the functional equilibrium of the pericemental tissues, converts them into a suitable field for the lodgment and multiplication of bacteria, which may reach that tissue via either the circulation or the gum margin.

Concerning the bacterial agent in pericemental inflammation, it should be remembered that *the nature of the invading organisms determines the character and progress of the inflammatory process, regardless of the resistance offered by the invaded structures.* The staphylococci and the streptococci are the two most important bacterial groups in pericemental inflammation, and the preponderance of either leads to manifestations differing both in their immediate and in their remote consequences. Thus the staphylococci are the principal forms in the type of inflammation characterized by a tendency to localization and abscess formation, and the streptococci represent the principal forms in the type of inflammation

having a tendency to spread and to involve large tissue areas. It would therefore seem that regardless of the degree of resistance of the tissues overlying the tooth-root or of those covering the area between the focus of infection and the gum margin, the bacterial element *per se* is the factor which determines whether the pericemental infection will end in abscess formation or in pyorrhea alveolaris. Pyorrhea alveolaris, the true form characterized by the ulcerative type of infectious inflammation, differs from pericemental abscess as it develops upon teeth with living pulps, or rather intrapericemental abscess, mainly in the nature and virulence of the bacterial agency. It is questionable whether the vital resistance of the tissues involved plays any decisive part in this respect. In both varieties of pericemental infection the pyogenic microorganisms gain access to the pericementum either through the circulation or through the alveolus, the organisms traveling in the space between the alveolar wall and the root of the tooth through the structures which Black has described as the glands of the pericementum, and which, as already stated, are epithelial remnants of the enamel organ.

The presence of these epithelial structures in the pericemental membrane is of more than histologic significance. They are the cellular elements which, when abnormally stimulated, through either septic or non-septic agencies, give rise to cyst formations that are frequently mistaken for chronic alveolar abscess, and being treated accordingly are not completely eradicated, inasmuch as an operation upon such swellings not having as its purpose the destruction of the internal lining of the cyst would result, notwithstanding thorough antiseptic treatment of the root-canals, in the development at some future time of another cyst of perhaps larger dimensions.

The writer has thought that some allusion to this phase of oral pathology would not be altogether out of place in this discussion, as it is his belief that certain cysts of obscure origin are caused by a deposition of uratic crystals in the pericemental membrane in close proximity to the epithelial structures in question, thus revealing for our investigation a possible new phase in the varied manifestations of uric acid retention.

As regards the treatment of the class of pyorrhea cases of gouty

origin, if, as pointed out, the absence of acidity would preclude the possibility of uratic deposition upon the roots of teeth, and, furthermore, if acid production or lessened alkalinity be dependent upon a condition of over-activity or fatigue, the first stage in the rational treatment should consist in placing the affected teeth in a condition of physiologic rest. Teeth which are slightly loose should not only be secured to the neighboring healthy organs, but the latter should be so treated that pressure during mastication upon the diseased organs may be entirely relieved.

I have purposely omitted all reference to systemic treatment, for that subject is of itself such a vast one as to preclude its discussion in conjunction with that of any other phase of the disease.

Conclusions.—(1) Pyorrhea alveolaris may be of systemic or local origin. Pyorrhea of systemic origin may occur as a manifestation of constitutional derangements, such as pulmonary tuberculosis, syphilis, Bright's disease, and gout.

(2) Gout is a disease caused by the incomplete metabolism of proteids resulting from hepatic inactivity.

(3) The initial phenomenon in pyorrhea alveolaris of gouty origin, and the one responsible for the deposition of uratic salts, is one of relative or actual acidity at some portion of the pericemental membrane.

(4) The relative or actual acidity above referred to is a sequel of pericemental over-stimulation.

(5) A deviation, even so slight as to defy detection, from the normal position which a given tooth should occupy in the jaw is the factor responsible for the formation of areas of lessened alkalinity or actual acidity in the pericemental membrane.

(6) The deposited urates establish a *locus minoris resistentiæ* in the pericemental membrane and predispose it to the invasion of pyogenic bacteria.

(7) Treatment of gouty pericementitis should comprise as a primary measure the splinting of the affected teeth.

(8) Loosening and loss of the teeth in senile and prematurely senile individuals should not be designated as pyorrhea alveolaris. It does not partake of the characteristics of pyorrhea, being in all respects typical of an atrophic process, which in such cases affects the retaining organ of the tooth.

(9) Oral manifestations of gout may assume the form of cysts, involving two or more vital teeth.—*Dental Cosmos.*

SOME FRAILTIES OF OUR PATIENTS.

By H. L. Seager, D.D.S., San Francisco, Cal.

"Life is mostly froth and bubble;
Two things stand like stone—
Kindness in another's trouble,
Courage in our own."

I do not entirely agree with the sentiment in the above verse—life is not *mostly* "froth and bubble," but that there should be some is a merciful dispensation, and none should welcome it more heartily than the dentist, who is called upon so often to soothe and cure another's trouble; and I have many times thought it a fine tribute to the profession that one rarely sees a melancholy or morose dentist.

The stein contains an epitome of life, according to the above definition—we have the froth and bubble, our Scottish friends call it, or something like it, a "cup of kindness," and all within hearing of my voice will remember occasions when some patient has sought the courage it contains, although it is only "Dutch courage."

If there is a better point of view for observing the frailties, yes, and the virtues, of human-kind than that of the dentist at the operating chair, I have never heard of it. The condition of mind and body of the average patient seems peculiarly provocative of candor, and some of the revelations made under stress of dental operations could hardly be exceeded in depth and interest even in the confessional. This being the case, it is no wonder that at times we are highly entertained, and have no difficulty in keeping our sense of humor keen.

The first frailty of which I shall speak is the universal expectation of pain on the part of patients. The diagnostic value of pain is recognized by all, and we often have occasion to use "Nature's signal" in our daily work, and so the phrase "Does that hurt?" is frequently on our lips—too frequently, perhaps, if one were to believe our friends, the mental scientists. I have been in practice now some sixteen years, and I can count on my fingers

the number of times I have received a direct negation. The reply is either, "Yes, it does," or "Not yet." Not yet, forsooth, as though the pain were inevitable as death and the tax-gatherers. And this comes so often from the lips of patients who know the strides we have made in this very direction—indeed, often following some commentary on this well-known fact, or from those who are ignorant of it. I venture to say that 75 per cent of the extractions made today are entirely painless, and in more than half the remaining 25 per cent the pain inflicted is more correctly described by the word "discomfort," and in filling and crowning operations, cocain, ether, hot water and hot air (of which latter commodity all up-to-date dentists have enough and to spare) have materially reduced the pain our forefathers suffered under like conditions.

Another peculiarity of like nature I have noticed is this—the extraordinary number of stoics there must have been a few years ago. How often have you heard a remark of this kind? "Doctor, I don't know what has come over me lately—I used to be able to stand the pain so much better some time ago," before the fire, or before Tommy was born, or before the flood, and I found myself envying the fortunate men who were practicing dentistry in those palmy days. Upon inquiry of my seniors, however, I soon learned that this was just as often made an excuse for cowardice then as now, and hence I have placed this also in the category of human frailties.

For the orderly prosecution of our work, it is of course necessary to divide our time equitably among those demanding our services; Mr. Black from 9-10; Mrs. Green from 10-10:30, and Miss Gray from 10:40-12, and so forth, and if all were punctual everything would go as merry as a marriage-bell; but what do we find? Mr. Black's alarm clock failed to sound at the usual hour, and 9:30 comes before we are fairly started, so we dismiss him promptly at 10, for Mrs. Green must not be kept waiting. Mrs. Green comes in breathlessly at 10:25 and says the cars were not running on Sutter street, and although she started on time and did her best she is sorry to find it is so late; more follows about the clocks. By this time we have learned wisdom, and conclude to take it for granted that Miss Gray will be late, and so

start a rather longer operation for Mrs. Green than we expected—whereupon Miss Gray comes sharp on time, and is so fretted with waiting that by the time we are ready for her she is not ready for us, and another appointment must be made.

I am aware that this frailty is more easily corrected than some others. A fee for appointments not kept or delayed will sometimes prove effective, but it is not always possible to apply such correction, especially for the young practitioner whose courage is not always equal to enforcing such a rule. It is something fearful to contemplate the number of clocks in this city which are always fifteen minutes to half an hour slow, and we wonder if these same patients are as late for the matinee or a bank dividend as for the dentist!

Closely allied to this frailty is one which candor compels me to say is indulged in mostly by the fair sex. I refer to the detailing of the family history, sometimes going back to the second or third generation. We hear all about the teeth of the family—when Helen cut her first tooth, and when Tommy lost his last; about the three complete sets grandpa had, and last, but not least, about that mythical ancestor who had a "double set all round."

Some time ago, in reading about Bishop Phillipps Brooks, I was much struck by the account of his tact in handling importunate visitors. It is said he could take a man by the hand and while manifesting a vital interest in whatever was said, he could gradually usher the man to the door without his having suspected what was done. I envy Dr. Phillipps Brooks and often wish for the particular gift of dismissing people without offense.

Practicing as I have done for some years in what might be called a suburban district, I have had a great deal of work for children; and one of the most aggravating practices of patients is a vicarious one, namely, the nervousness of a mother or guardian for her charge. This is a natural feeling, and one with which we all should, and do, sympathize; but there comes a time when sympathy can be overdone, when the terror of the mother is communicated to the child. I contrive to be alone with my little patient, if possible, and when this seems impossible of accomplishment, there is nothing to do but divert the conversation

from the child's nervous temperament—his extreme sensitiveness, and his inherent delicacy of constitution, for they all seem to have these peculiarities, and it is on such occasions that one has to draw upon his fund of stories and anecdotes, new and old, in an effort to change the current of thought.

On the frailties of patients in the matter of bills, I shall not dwell long—the subject is a painful one for the dentist. I have one case in mind, however, which amused me very much. I extracted an upper bicuspid which had a history of long-standing abscess, removed some necrosed bone, and afterward placed a denture. I heard nothing from the patient for some months, when I tried to collect the bill. After nearly two years had passed, I received a letter saying that I had promised not to press the bill for payment, and in any case I had broken her jaw, and would I be kind enough to credit her with $15 on account, check enclosed?

Another, calling eight months after work had been completed for his wife, asked me what discount I would make for cash! I told him the bill was for the full amount stated, but that I would not object to receiving 6 per cent interest for any time the bill had run over ninety days.

We must not forget, in reciting these various peccadillos of patients, the Scriptural injunction to remove the beam from our own eye so as to see clearly the mote in our brother's, and so I pass round a box containing a couple of specimens of dentists' frailties. The first is a tooth, containing, or rather overflowing with, an amalgam filling—it certainly betokens generosity on the part of the operator, and is a marvel of contour work. The man from whose mouth I removed it said that he had spent more for toothpicks than for kindling wood during the two years he had carried it.

The other is a small bridge I removed last week. The canal for the part of the Richmond crown was made by drilling through the mesial side of the bicuspid root into the alveolar septum with the inevitable result of abscess, pain and swearing.

And so, in closing, let me say that we are none of us quite free from frailties, and should exercise a certain degree of

charity for both patient and fellow-practitioner. I leave with you a couplet from Shakespeare:

"Also our frailty is the cause, not we,
For such as we are made of, such we be."

—*Pacific Dental Gazette.*

THE PREPARATION OF THE MOUTH, IMPRESSION AND MODEL FOR THE SEATING OF BASE PLATES. By J. A. Bullard, D.D.S., Chicago. Prosthetic dentistry, or plate work, is fast becoming to mean to some the making of plates for edentulous mouths, or where but two or three teeth still remain in position.

It has been stated that this branch of dentistry has made no progress in the last twenty-five years, but when you come to look at it from the point of view that, as soon as some method is developed for supplying missing teeth other than by partial plates, it is taken away from prosthetic dentistry and called something else—as is the case with bridge work, or where we put some little hook or button or any means of support other than the clasp on a partial plate, it is then dignified by being called "removable bridge-work" and put in a class by itself—you can readily understand that prosthetic dentistry, instead of being a branch of dentistry, is a piece of the trunk with the branches pretty well cut away.

I wish to speak of those cases which depend upon the adhesion of a base plate to the tissues of the mouth to retain the set in position, and not upon springs, clasps, etc.

My remarks will apply more particularly to the upper jaw than the lower, and your attention will be called to a few conditions found in some mouths which need surgical attention before taking the impression.

Where there has been the extraction of a number of teeth, the process, if broken, should be looked after, removing sharp, rough edges and loose pieces, and the gum made as smooth as may be.

Sometimes in extracting anterior teeth, especially the cuspids, the process is thin over the root and adherent to it; in springing the tooth out to loosen it the process is broken, the soft tissue under the lip is torn loose from its attachment and drops down, and if allowed to heal in this position will shorten the action of the

lip and make a very low rim to the plate. This tissue should be put back in place and retained by two or three sutures until healed; or if a temporary plate is made it will hold it in place. Where the tissues have been lacerated and allowed to heal into the socket of a tooth so the attachment of the buccal tissue is brought close to the ridge it should be cut loose and packed away until healed.

Another condition in some mouths is that produced by wearing a full upper plate and only the natural anterior teeth below to occlude with it. The constant pressure and movement of the plate causes the anterior process to absorb away, leaving a ridge of soft tissue, which rolls around under pressure, and a satisfactory plate cannot be made over it. This tissue should be removed, and when the surface has healed the result will be a ridge of something like uniform density to work upon.

Just a word in regard to the absorption of the alveolar ridge and the length of time a plate should be worn.

We do not know why the alveolus is absorbed away so excessively in some cases and not in others, but a very accurate opinion can be formed as to whether it is going to take place or not before the teeth are gone. To cite two extreme cases: First, where the process is very dense and heavy, the teeth having long roots and short crowns, but have been lost through caries, with, however, no diseased condition of the roots and no tendency toward pyorrhea; if there is not too much damage done in extracting, the process in these cases will not absorb away excessively, but will change very slowly through life, and the soft tissue will remain hard and dense over it.

On the other hand, where a case presents with the process thin and frail and perforated by pus tracts, or where the teeth are being lost from advanced stages of pyorrhea, there will be great change after the teeth are gone and the gums healed. The remaining process will rapidly absorb, and in a few years almost entirely disappear.

A plate made for the first case, six months after extraction, might be worn without much discomfort for ten or fifteen years; while for the second case the plate would have to be changed every two or three years and would need considerable attention in

trimming the rims and edges to avoid injury to the soft tissue as the ridge absorbs.

Generally speaking, plates should not be worn over five or six years. Oftentimes a patient will wear a plate too long after the ridge has absorbed away, and the sharp edge of the plate has cut a series of grooves and the soft tissue will hang in flaps under the lip. These flaps should be cut away, the rim of the old plate cut down and covered with antiseptic gauze to keep the freshened surfaces of the lip and ridge from healing together; and in two weeks you can make a plate which will be comfortable and useful.

In a few cases the extreme posterior ridge of the upper will be dense gum tissue as large as your little finger, and will roll from side to side under pressure. If removed, the plate will set with much more stability.

After having the mouth in as favorable a condition as possible, our efforts pass on to the treatment of the impression and model, with the object in view of obtaining an equalization of the pressure of the plate against the tissues upon which it rests.

If we had a material from which a model could be produced that absolutely represented the mouth, the necessity of relief in the impression and upon the model would be reduced to a minimum.

The reasons for the required relief of the palate of an upper plate are: First, running through the palate on the median line usually there is a hard, bony ridge. This ridge varies in size from being nearly invisible to the eye (but can be felt by the finger), to a large, bony formation, perhaps three-quarters of an inch across. This area of the mouth being hard and the gum tissue soft, it is necessary to construct the plate so that it may rest harder on the gum tissue than in the center of the palate.

Second, the hard structure of the palate does not change in form but slightly during the plate-wearing period of life, while the alveolar ridge absorbs away. The relief allows the plate to follow this absorption of the ridge and still avoid heavy pressure in the palate, and renders the plate useful for a longer time.

The third reason for relief is to allow for the inaccuracy of the plaster model caused by the expansion of the plaster of the impression and model in setting.

The lateral expansion of the plaster of the impression is pre-

vented by the rim of the tray, so it expands in line of least resistance, causing an arching of the palate. The plaster of the model expands in the same line, causing a second lifting of the palate. So the difference in the arch of the model and arch of the mouth is that caused by the two mixes of plaster of Paris.

This has been proved by experiments carried on by various members of the profession, including Dr. S. J. Spence of Chattanooga, Tenn., and Dr. J. H. Prothero of our city has done some very positive work along this line.

The expansion of plaster was first called to my attention by Dr. E. J. Perry several years ago. He was very positive about it, as he had just repaired a china doll whose head had been broken off at the neck by filling the hollow of the head and neck with plaster and placing the parts in position. The repair was all right, but the fragile skull could not stand the expansion of its plaster brains, and opened up in various cracks.

So this third cause calls for the relief of the palate to bring the plate back to the form of the mouth.

Another reason for the relief of the palate where considerable absorption has taken place is to prevent the pressure of the base upon the anterior palatine nerves as they come through the foramen just back of the anterior alveolar ridge. Pressure upon these nerves may cause severe pain. Quoting Dr. T. W. Brophy: "This pressure and irritation caused by the base plate resting upon these nerves is a frequent cause of neuroma and may necessitate an operation."

The same condition may exist where there has been extreme absorption of the process of the mandible. The mental foramen is brought within the area covered by the lower denture, and pressure upon the mental branch of the inferior dental nerve will cause great pain. The plate will have to be carefully trimmed at these points.

In the majority of cases the relief of the plate in the palate can best be accomplished by scraping the impression, and this calls for as much good judgment as any step in the construction of the base.

The hard ridge through the center of the palate should be scraped out its entire length to about one-twelfth of an inch in depth, starting about three-eighths of an inch inside the posterior

plate line and gradually deepening the relief to avoid sharp angles, and working forward through the impression to about three-eighths of an inch of the anterior ridge, gradually shading it out. The width of this relief will be determined by the width of the hard ridge through the palate. It will be widest at its posterior part and taper forward. A second relief is scraped on each side of the center one and carried forward and blended with it. This gives three saucer-shaped depressions in the plate. The center relieves the pressure in the center of the palate, and the ones on each side give relief and suction. The little ridges between the center and sides are scraped some, but not removed entirely to open the relief up into the one chamber, so the plate feels as though it did not touch the roof of the mouth. The old form of air or suction chamber only partially relieves the pressure, as the plate rests hard on the palate both anteriorly and posteriorly to it.

This scraping of the impression in the palate is all the work which is necessary to be done upon it. In a few cases where we have the large, bony formation in the palate I use tin foil relief on the model instead of scraping the impression, placing three, four or five thicknesses of No. 60 tin foil over the required area, as the whole palate is hard and needs uniform relief.

The separating material used is of considerable importance, and I have never seen anything for this purpose to equal sandarac varnish. The impression may be stained with shellac, and then apply the sandarac, or by using a little indelible lead, which should be scraped into the sandarac and makes it blue, so that, in separating the line between the model and impression may be seen and it gives a model with a hard, glassy surface. Care should be used to remove the excess varnish or other material used for the purpose. After applying the fluid to the surface of the impression with a camel's hair brush, wind a little cotton around a toothpick and wipe the excess out of every little depression of the rugæ, or any little point on the ridge; for if these are filled with varnish it is the same as scraping the model in such places, and the plate will bear hard upon them.

Usually it is not necessary to do any work upon the model to equalize the pressure, only to relieve or scrape it around the plate

line, especially across the posterior line, so that the plate shall set up closely to the tissue and will not leak.

In some mouths the ridge is very uneven, caused by teeth having been extracted at different times. Where they have been out the longest the gum may be soft and spongy, and where the extraction has been of more recent date the process is hard and prominent.

To even up the pressure on the ridge and avoid the rocking of the base over the hard points, scrape the soft ridge on the model and cover the hard points with tin foil.

All mouths vary, and each has to be treated according to its peculiarities. Careful study, good judgment and attention to all the little details are necessary.

One of the great features of seating the base plate is to anatomically grind and arrange the teeth so as not to unseat it.

Dr. Prothero went into this subject so extensively in his paper that it is not necessary to discuss it here, except to say if there are no other teeth in the set ground, grind the four cuspid teeth sufficiently to take the points off so they will not knock the plate loose on the lateral movements of the lower jaw.—*Dental Review.*

EXTRACTING. By Amy G. Bowman, D.D.S., Los Angeles, Cal. Permit me to offer a plea for qualities that every operator who essays this work should possess—a plea for humanity, the kind of humanity that is fairly saturated with the milk of human kindness, and let this, in turn, include gentleness, consideration, care, confidence, cheerfulness, self-control, absolute cleanliness and ability.

And though I place ability last on my list, it is of course all-important; but I contend that the operator should have all the other qualities well developed first, and soon the hard but efficient school of experience and practice will develop the ability.

By this I do not mean a slaughter of the innocents, while the green youth is experimenting on the dear public at large; because I am presupposing that he has had two, or three, years at least of practical experience in the operating clinic, during his college course, and with that start he is, or should be, somewhat ready for business.

Now, for a moment let us analyze these desirable qualities.

Humanity, the sort that is saturated with the milk of human kindness. I want to emphasize this quality very strongly, for surely it is needed here of all places, and in very large doses, for we know that the average person dreads and fears an extraction almost as much as the plague, and therefore delays it as long as possible.

There are two handmaids of this quality which are also very necessary—gentleness and consideration.

Gentleness is one expression of kindness; but do not mistake me. I am quite aware that, paradoxical as it may seem, the greatest kindness you can do for people sometimes is to hurt them; but I do claim that this can be done so kindly, and skilfully, that far from resisting it, the patient will thank you.

If the patient is a woman, all the more need of these qualities, for we must remember that she has much to make her supersensitive at times. She may be an overtaxed school girl, a wage-earner, the hard-working mother of a large family, the self-constituted slave of the dressmaker and society, with its arduous and often senseless exactions, or, perchance, she is a waif of the streets or a denizen of the slums, or, again, that most sacred of all persons, a young, timid, expectant mother. She may be any one of these, I say, and the operator must be enough of a physiognomist and diagnostician to approach the patient correctly, for here can be laid down no hard and fast set of rules to guide him, and fortunate indeed is he who can read between the lines and meet each patient with that exquisite tact and treatment which each individual case calls for.

As for consideration, it would almost seem that the former quality of gentleness covered it; but not so, or at least not wholly so.

There are a great many expressions of it; for instance, be considerate enough of patients to allow them to recover their equanimity after an operation, and never under any circumstances joke or twit them for any little short-comings, and, of course, never remark adversely about any altered facial expression. If there is no woman attendant, see that the patient is presentable before dismissal, for I have more than once seen women on the cars, and in the streets, with blood spots and even blood-stained

finger-marks on their necks and faces, to say nothing of the soiled pledgets of cotton decorating their garments, and perhaps some of you will also recall having seen the bosom or collar of an otherwise immaculate shirt adorned with such things. This carelessness on the part of the operator is quite unpardonable, for a touch of hydrogen peroxid on the linen would remedy that, and for the rest, water is always at hand, and brushes should be in sight for the patient to use.

Be considerate enough not to laugh at or make light of a patient's expressions of suffering, even if you know that some of it is acquired for the occasion, for there is enough pain of the genuine kind to more than make up for it.

If the operation has been performed under a general anesthetic be considerate enough to pay no attention to any disclosures of family or business secrets, or little personal matters that may be revealed to you while the patient is under the influence of the anesthetic.

Forget them instantly, be a gentleman and true-blue on such occasions, and if the patient on recovering consciousness asks, "Did I talk, Doctor? What did I say?" just tell a few big white ones, for they are quite permissible here; otherwise you are apt to lose the patient, and serve you right.

As to gentleness, be an allopath in this respect, whatever school you may have a leaning to. I have no use for the namby-pamby or sissy operator of either sex, but I contend that your skilfulness is but increased by your gentleness.

In extracting for children we particularly need to exercise this quality, because in most cases unless they have already made your acquaintance for a milder or more favorable operation it is rather a bad introduction, and quite unfortunate for both patient and operator. This, of course, refers mainly to those cases where upon examination we really find it a case for the forceps, for many times a little tact and one of the little aseptic napkins is about all that is necessary. Adults are only children of a larger growth, however, and it is really surprising how babyish they can be on occasions; so, I repeat, deal gentleness with a lavish hand.

As to confidence, the operator needs to be an egotist in this direction, and to be so thoroughly sure of himself that the patient

is so impressed and imbued with it that he ceases to fear, and is encouraged by the operator's every word, look and deed. Have such good control of yourself that even if things are not quite what they seemed at first, go right along without betraying it to the patient, and in most cases you will soon find a way out of the trouble. We all know that this self-confidence both wins and keeps us patients. No other one operation will cause you to be either so loved or so disliked by them.

An adjunct of confidence is perfect self-control. If the operator leads a well-balanced life, as all professional persons should, his own nerves are true as steel, even under the most trying conditions, and the delicate touch as well as the good stout muscle are his for keeps, and he does not find it necessary to step into his laboratory and take a "bracer" before using his hypodermic for a local anesthetic, for instance.

Let cheerfulness abound during this operation of extracting. Not levity, mark you, for that would be despicable and would also savor of the charlatan and street fakir, but genuine cheerfulness of manner, so the patient will not feel as though he were about to become chief mourner at his own funeral.

I need hardly mention, I suppose, that cleanliness, absolute both of person and instruments, is indicated here of all places in our work, for in every truth this is a surgical operation; perhaps major, perhaps minor. Forceps, elevators, needles, pliers, cotton, napkins, all should be sterilized and warm. As for the napkins, I could enlarge on these *ad libitum, ad infinitum,* but that's another story. Anyway, use them in allopathic doses.

May I say a few words about extracting under general anesthetics? Have the operating room *quite* ready before bringing in the patient, and substitute if possible a white linen coat or gown for the ordinary office coat, and have at hand the usual and authentic restoratives and stimulants; also instruct the attendant to place the hot water bag to the patient's feet, and by keeping the body warm guard against shock. If chloroform is advisable have it administered at the patient's home, or, better still, at the hospital; this relieves the operator of any responsibility outside of his own work.

In extracting for abscessed conditions we should all be hydro-

paths, not forgetting to add good antiseptic washes. If the patient is weak from loss of sleep and nourishment, give a good, rich cup of malted milk, or beef tea, and be chary with administration of whisky or brandy, and if they are necessary as stimulants, give teaspoonful doses, or you will likely have an hysterical condition in their weakened state; then advise, nay, insist, on rest and quiet, followed by a generous diet of light, nourishing food and also strict attention to systemic conditions with regard to bowels, kidneys, bathing, etc. Most cases will respond rapidly to this kind of treatment and you will have much better and happier results than the careless operator who hands the patient a glass of cold water and turns him loose.

Now, for my long-delayed ability, "capital letters, if you please." Only the best effort is permissible in this field—the SURGEON DENTIST. No others need apply.

In cities of any size we now have the specialist in this branch. It was my privilege a few years ago to read a paper before this association in which I predicted this, and do you know there were many broad smiles at my "far-fetched" notion, as one man dubbed it? Hardly three years had elapsed when two extracting specialists made their appearance in San Francisco, and it did not take long for the busy operator, at least, to welcome their advent.

The extracting specialist! All hail to him! We need him every passing day or so.

Let us dentists educate our patients up to the standard of specialties in our work, and presto! what a heavenly thing it will be to practice.—*Pacific Dental Gazette.*

STERILIZATION OF DENTAL INSTRUMENTS. By Robert T. Morris, M.D., New York City. The reason why dentists, as a rule, are not so particular as general surgeons about antisepsis and asepsis, is probably because the mouth represents one of what we call the "protected areas of the body." Where bacteria are found constantly and in great numbers, nature seems to assemble protective cells in such a way as to guard continually against the entrance of infection in the tissue. We usually get primary union in operations about the mouth, even though it is quite impossible to maintain asepsis. The same statement is true of oper-

ations about the anus. What we have to fear most from infection by dental instruments is the insidious infection caused by repeated inoculation with minute quantities of bacteria which happen to be actively proliferating colonies. For instance, in treating a case of pyorrhea alveolaris, if a few colonies of actively proliferating bacteria are carried to the tissues day after day by instruments which are imperfectly sterilized, a case that might otherwise be quite amenable to treatment may persist indefinitely. It is these insidious infections which cause annoyance, rather than the grave infections which make a more marked demonstration, that we are apt to have from the use of imperfectly sterilized dental instruments. One does not see very many cases of syphilis transmitted by dental instruments, and yet there are numerous cases on record which probably had their origin in that way. Instruments used in treating a tooth abscess would be particularly apt to carry infection to another patient, because of the activity of the bacteria in the parent case.

In order to have dental instruments perfectly sterile, it is quite necessary to have them free from all traces of rust, particularly the kind of rust which makes little more than tarnish. The best way for keeping instruments bright and free from rust is to immerse them for some hours, or even for days, if one wishes, in a saturated solution of stannous chlorid. A basin of stannous chlorid crystals, to which water is added from time to time, can be kept in the office, and instruments are tossed into it from time to time. The stannous chlorid makes a soluble salt of the iron oxid which causes the tarnish, and removes not only hiding places for minute bacteria, but also keeps the sharp edges of instruments intact.

Boiling of instruments in a one per cent solution of sodium carbonate furnishes an excellent method of sterilization, and one which practically fulfills all of the indications, as it removes traces of organic matter at the same time that bacteria are destroyed. The addition of the sodium carbonate to the water is for the purpose of preventing oxidation which would tarnish the instruments and which would dull sharp edges. The boiling of instruments calls for a good deal of special trouble and attention, and for that reason it is very often neglected.

I know with certainty that sterilization of dental instruments is

very often neglected, because I have had occasion to be in many dental offices supposed to be well appointed, and could not help making observations. Perhaps the most practical method for sterilization of instruments in the offices of very busy men is the phenol and alcohol method. Instruments even imperfectly cleansed can be kept in a receptacle of phenol where they are practically sterilized, and remain sterile. They may remain indefinitely in such a receptacle, because the phenol is closely related to the alcohols, and does not attack metals. When instruments kept in phenol are wanted for use, they are picked out with a pair of forceps and tossed into another receptacle of alcohol. The alcohol instantly neutralizes the phenol and removes it. If patients object to the odor of alcohol on instruments, the instruments can be dropped into another receptacle of sterilized water for a moment. For all of the smaller instruments, it seems to me that this offers the best practical method for sterilization in every-day office work. Very few people really object to the odor of phenol, because they have learned to associate it with cleanliness. As a rule they like the odor much more than I do. It is no trouble, however, to keep the phenol receptacle covered.

It is a mistake to suppose that patients do not know a great deal about the matter of sterilization of instruments. They say to me a good many things that they do not say to their dentists. People have become pretty well educated in the principles of asepsis and of antisepsis.—*Dental Brief.*

SCIENCE AND LONGEVITY.—The recent publication of Metchnikoff's essays on The Prolongation of Life arouses fresh interest in the relation of medical science to the term of human existence, and indeed in the whole question of human longevity. It is unquestionably the function of the physician to preserve and thus prolong life in the individual; hence it must be conceded that it is the function of medical science, of which the physician is an individual exponent, to find ways and means of prolonging life in the race. But both in the case of the individual physician and in that of medical science the question of longevity is inextricably bound up with a variety of other aspects of life which render it an exceedingly complex problem.

The mere prolongation of physical life is, in itself, a very simple and easy matter. Given a reasonably healthy body and a fair heredity, and it is highly probable that any individual may attain longevity if he is willing to submit himself to the discipline and severity of what is commonly known as "the simple life." By this we do not mean merely that a man should abstain from excesses of eating and drinking and over-indulgence in the sensual appetites, go to bed and get up in good time, and maintain the eliminative functions of his body. Thousands of people do this all their lives and yet do not attain old age. But if, in addition to these purely hygienic measures, he be willing to refrain from all of those mental and moral strains that pertain to the strenuous demands of modern sociology and economics, and live, in toto, the life of an oriental philospher, he stands a very good chance of living to a ripe old age and putting the medical man, so far as he is concerned, out of business.

The fact is, however, that the conditions of modern life, with its increasing exactions, are not to be set aside by the mere dictum of the hygienic scientist; and the question is, whether long life at the expense of such a negation is a thing worth striving for. In an age or a country where a simple routine of this kind represents the general sum of human life, old age on this basis is doubtless a desirable consummation, and its attainment by these means a rational process. But to urge upon men the pursuit of longevity by effacing themselves from all that makes up the sum and inspiration of the age and communism of which they are a part is both an anachronism and an anomaly. Such an appeal will find no considerable response in the wills and lives of mankind, nor is it consistent with the broad march of human progress that it should.

There are in our midst, personally known to most of us, some examples—accidental examples, so to speak—of this anomaly men and women whose lives were, by reason of their birth and surroundings, lived in some exceptionally secluded places of the earth and under exceptionally simple conditions, and who by virtue of their severity of living, have reached an exceptionally old age. What is their guerdon? Some degree of physical health—just enough to make them unable to die; the capacity to eat and

drink and sleep—the faculties of an infant without the infant's future; and the right to be idle. The very simplicity of their lives has left their old age vacant and insipid, with a paucity of interest and occupation which of itself would speedily kill them if the same simplicity of life had not insured their bodies to longevity. Does anyone who has lived, and is still living, the fuller, richer, faster life of the age envy them their longevity, or covet it at the expense of their own experience?

The prolongation of life, if it is to be worth achieving (and unless it be worth achieving it will not be permanently achieved), involves far more than the mere preservation of the tissues, and calls for more than a reactionary railing at the spirit of the times. No one wants quantity at the expense of quality. Just as the individual physician must, if he aims to be a successful practitioner, maintain the health of his patient without interfering seriously with his patient's effectiveness as a business man or with his domestic status, working out his hygiene and treatment with special reference to his particular occupation, economic relations, etc., so must medical science as a whole reckon with the spirit of the times and find ways and means of prolonging life while the procession moves—for the procession will continue to move, longevity or no.

The conclusion of the whole matter is that longevity under modern conditions cannot be adequately compassed by medical or physical science alone. It is a problem which physical science must work out in conjunction with other phases of life. It must be recognized that life is becoming all the time more and more than a mere physical existence; the mental and moral, the social and economic elements dominate the physical more and more, and mankind is finding, and will increasingly continue to find, other things more important and absorbing than the maintenance of the metabolic balance, unless indeed the preservation of that physical balance can be rendered genuinely subservient to the promotion of these other dominant aspects of life.—*Editorial in The Medical Standard.*

The Dental Digest.

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All communications relating to the editorial department should be addressed to Dr. J. P. Buckley, Editor, 163 State Street, Chicago.

Editorial.

THE REORGANIZATION OF THE NATIONAL DENTAL ASSOCIATION.

A review of the reading pages of the various dental journals for the last five or six years will show that the DENTAL DIGEST has perhaps published more papers and editorials on reorganization than any other journal. Inasmuch therefore as the reorganization of the National Dental Association seems to be the paramount question in dentistry today, we feel justified in again briefly discussing this subject.

At the last meeting of the society in Boston it was proposed to reorganize. A committee was appointed, with Dr. J. D. Patterson as chairman, to report a feasible plan at the next meeting in 1909.

The National Dental Association exists in name only. The society called by this name is by no means the representative society of the dental profession. That this is true is regretted by every dentist who has the welfare of dentistry at heart. It has made no progress in attracting new members, while the American Medical Association has increased from a few to many thousands, and while the Illinois State Society has begun and directed a campaign which has established and maintained a society several times as large in numbers as the National Dental Association, and has resulted in the reorganization of many other states on a similar plan.

The history of the National Dental Association will show that the same few men have been on the Executive Council and chairmen of other committees uninterruptedly for a period of ten years. Granting that this small group of men are conducting the affairs of the society for what they honestly consider to be the best in-

terests of the profession, the fact that they have kept themselves in power is displeasing, to put it mildly, to progressive men, and has caused many members to retire from active participation in the work of the association and prevented thousands of others from joining the society and lending it the support it needs and which, under normal conditions, it would have every right to expect. The effort to reorganize at this time might be taken more seriously by the profession at large, were it not for the fact that a year ago formal resolutions were adopted by the Illinois society and presented by its representative to the National, requesting the latter society to awake from its lethargy and take up the important work of reorganization; but no attention was paid to the appeal and the resolutions joined the Army and Navy Bill only to go the road that many important and valuable measures have so often gone before.

We fully understand that it is a fruitless task to stand on the outside and criticize. What should be done is to join the society and endeavor to correct matters from within. But there is little to encourage men to join an organization that is so inharmonious in its actions and characterized by discord and discontent. Harmony is the strength and support of all institutions, without which no organization can hope to succeed. In the September issue of Everybody's Magazine, Frederic Thompson, the originator of Luna Park, the two-and-one-half-million-dollar New York playground, says that a picnic or amusement park cannot be made a success without the "carnival spirit." Neither can a dental society be successful without harmony and good-fellowship; without the elimination of personal aggrandizement. There should not be evidenced any superficial brand of fellowship, but each member should be animated with that truer, deeper, broader feeling which animates the soul and beams from the hearts of men. There should be manifested that peculiar something from within which stands for truth and justice whenever humanity clashes with humanity. We believe that this spirit does not exist today in the National Dental Association, or, if it does exist in any degree among the few hundred men who are members of the organization, then it certainly does not among the nearly forty thousand who are not members. How to satisfactorily adjust this condition is indeed a difficult problem.

There are thousands of young men, and by young men we do not mean recent graduates, but men who have been doing their full duty toward the advancement of dentistry for the last ten, fifteen or more years, who are ready and anxious to join the National Association just as soon as that organization shows the right disposition, and proves itself worthy the name by which it is known; just as soon as the society is conducted with the central idea of advancing the profession of dentistry.

In order for the committee of which Dr. Patterson is chairman to present a practical plan and have it adopted, it will be necessary for the members to be ready and willing to give and take—a spirit which, in the past, has not been in evidence. Whether or not Dr. Ottolengui's suggested constitution and by-laws are modified and adopted, it should be impossible, according to the constitution under which the society is working, for one man to remain on the Executive Council for a longer period than three years. Let us hope that something tangible will result from the appointment of the committee on reorganization, and, if a spirit of earnestness is manifested, the movement will be loyally supported by every progressive dentist.

HYPEREMIA.

Our readers' attention is hereby directed to an article and the discussion on Hyperemia by J. F. Binnie, M.D., in this issue of the DIGEST, page 1231. This article should be read carefully by every dentist who is interested in advanced therapeutics. The so-called method of "cupping," or of producing hyperemia, cannot but prove beneficial in the treatment of certain forms of dento-alveolar abscesses and pyorrhea alveolaris.

Last winter at a meeting of the Chicago-Odontographic Society, Dr. J. E. Keefe demonstrated a method of applying suction to the gums in the treatment of pyorrhea, and referred to the fact that Dr. J. B. Murphy and other surgeons were using the same principle in treating certain diseased conditions in various parts of the body. It now remains for some ingenious dentist to devise a practical appliance by which dental applications can be made, and much good will surely result from this method of assisting Nature in her effort to restore an abnormal to a normal condition.

Bibliography

A Text-book of Operative Dentistry by Various Authors. Edited by C. N. Johnson, M.A., L.D.S., D.D.S., Chicago, Ill. Published by P. Blakiston's Son & Co., Philadelphia, Pa. Pp. 755, 618 illustrations. Price, cloth, $6.00; sheep, $7.00; half morocco, $7.50.

Notwithstanding the fact that a number of excellent text-books on the subject of Operative Dentistry have appeared in recent years, this splendid work of Dr. Johnson is destined to occupy a distinctive place in our literature. Such a work can result only from a lifelong study of this subject, and the author here presents to us the results of his long experience and his many years of the closest study and investigation of every phase of operative dentistry.

A glance at the synopsis of the work reveals at once its wide and comprehensive scope. Indeed, in the minds of some, the question might arise as to whether the book goes beyond its title, but when we stop to consider that it embraces no subject which is not of vital importance to every practitioner of dentistry, and for a knowledge of which he has constant need, we must conclude that such a work may properly include all the subjects treated.

Although it is a book intended for both practitioner and student, we note with pleasure the absence of those minute technical details which are burdensome to the former, and a knowledge of which is required of the latter before he is allowed to enter upon the study of the general subject of Operative Dentistry; details which would be of little value to either. From the first page to the last, therefore, there is not a paragraph that may safely be omitted by the reader, but the entire work is worthy of the closest study.

A glance at the names of the contributors is at once a guarantee of the quality of the work, for we find that the author has called to his assistance men of the very highest standing and ability; and, while we may not entirely agree with their views in all particulars; yet, on the whole, their teachings will be accepted as fully in accord with the latest and most advanced thought of the day. Originality is stamped on every page, both in the chapters written by the author, as well as in those contributed by the men who have assisted him.

Chapters III, VI. XIV and XXIV, on the subjects, respectively, of "Hygiene and Arrangement of Light in the Operating Room," "Dental Caries," "Inlays," and "Treatment of Children's Teeth," are contributed by the author, and here we find that clear, concise, comprehensive and lucid statement which characterizes all the writings of Dr. Johnson. Chapter VI particularly is worthy of the closest study, the etiology, progress and phenomena of dental caries being presented in a thoroughly scientific and most able manner. It is evidently the product of a mind that has

delved deeply into every phase of the subject, while the conclusions reached as regards the practical application of our present knowledge of caries are sound and logical, and may be regarded as absolutely essential to the intelligent practice of dentistry.

Particular attention is also directed to Chapters II, XVIII, XIX, XX, XXI, XXII and XXIII, the contributions of Dr. J. P. Buckley. No more comprehensive treatment of the subjects presented have ever appeared in our literature. The majority of practitioners will perhaps be most vitally interested in Chapters XXI and XXII, for here we find not only the most advanced knowledge of "The Chemistry of Pulp Decompositions," "The Treatment of Putrescent Pulps," etc.; but we find also many valuable thoughts which suggest along what lines future research should be directed.

Dr. George W. Cook contributes a chapter on "Erosion." A study of this chapter shows the author to be thoroughly familiar with all the literature bearing upon the subject and scientific research that has been made in recent years. While our knowledge of erosion is altogether meager and chaotic, yet work of this character serves to place the subject on a scientific basis, thus offering hope for its solution in the near future.

About one-third of the volume is devoted to the subject of Orthodontia, the contribution of Dr. Herbert A. Pullen. Beginning with the subjects of Arch Development, Occlusion, Articulation, Facial Symmetry, etc., the author considers carefully those influences intra-uterine, post-natal, environment and disease which have a bearing upon them.

Passing to the subject of Corrective Appliances, the various forms are fully described, together with the technique of their construction and application, and the results to be expected from their use. To one desiring to study the essential principles of orthodontia in a work not too detailed nor voluminous, we heartily recommend this chapter of the book.

In a review that must be kept within reasonable limits it would be impossible to comment on each of the thirty-one chapters which the book contains. There are seventeen contributors, all of whom are recognized as men of the highest attainments, and the whole field of Operative Dentistry, in all of its phases, is covered in a manner more comprehensive than has heretofore been attempted. It contains nothing obsolete, but, on the contrary, is fairly bristling with the very latest thoughts and ideas along both scientific and technical lines. As an example of this we note the fact that the subject of cast-inlays is very fully covered, this chapter being contributed by Dr. J. E. Nyman.

Typographically the work is above all criticism, and is a beautiful example of the printer's art. The cuts and illustrations are, for the most part, new and original, and appeal to even the most casual observer as being strikingly clear and exact.

Both the author and the profession are to be congratulated on the appearance of this volume, the former that he is enabled to thus further

benefit the profession to which he has devoted the best efforts of his life, and the latter that it may still further profit from the genius and the vast experience of the author and those who have so nobly assisted him.

L. S. T.

Obituary.

HIRAM COLE, an old-time dentist of Santa Rosa, Cal., died September 9, 1908.

JESSE KELLEY, 73 years old, one of the oldest dentists of Geneva, O., died September 9, 1908.

JOHN BELL, 71 years old, for forty years a dentist of Chelsea, Mass., died September 16, 1908.

ORLAN T. EDDY, a dentist of Decatur, Ill., died suddenly, from heart disease, September 7, 1908.

A. J. WAID, 76 years old, a dentist of Monmouth, Ill., died after a long illness, September 11, 1908.

WILLIAM H. EVANS, 51 years old, a dentist of Napa, Cal., died from apoplexy, September 6, 1908.

H. S. SPALDING, 64 years old, a prominent dentist of West Union, Ia., died suddenly, October 2, 1908.

C. H. PAUL, 64 years old, a dentist of Omaha, Neb., dropped dead while extracting a tooth, October 6, 1908.

EMANUEL HONSINGER, 85 years old, for forty years a practicing dentist of Chicago, died September 17, 1908.

B. R. WEST, 70 years old, a widely known dentist of Philadelphia, died from heart failure, September 18, 1908.

NATHAN KUNS, a prominent dentist of San Bernardino, Cal., was shot and killed by a miner, September 8, 1908.

ALTUS T. ARNOLD, 40 years old, a prominent dentist of Leitchfield, Ky., died from heart failure, September 24, 1908.

HENRY J. STEVENS, 79 years old, a dentist of New Haven, Conn., died from a complication of diseases in October, 1908.

I. FRANKLIN WARDWELL, 54 years old, a prominent dentist of New York City, died from heart disease, September 17, 1908.

EDWARD C. THROCKMORTON, 72 years old, for nearly forty years a dentist of Marion, O., died from apoplexy, September 6, 1908.

HARRY QUIMBY, a noted dentist, having done work for the Queen of England and members of the royal family for many years, died in Monterey, Cal., September 12, 1908.

GEORGE PHELPS, 79 years old, a dentist of Columbus, Ga., died in New York City, the result of an operation, September 17, 1908.

ISAAC N. CUSTER, 76 years old, a dentist of Westerville, O., and a cousin of the famous Gen. Geo. A. Custer, died September 9, 1908.

CHARLES E. LATIMER, 78 years old, at one time a well-known dentist of New York City, died in West Palm Beach, Fla., September 26, 1908.

Notices.

NEBRASKA DENTAL SOCIETY.

The annual meeting of the Nebraska Dental Society was held in McCook, September 24, 1908, and officers for the ensuing year were elected as follows: President, J. M. Prime, Oxford; Secretary, W. A. McHenry, Nelson; Treasurer, J. A. Gainsforth, Holdrege.

NORTHEASTERN NEBRASKA DENTAL ASSOCIATION.

The second annual meeting of the Northeastern Nebraska Dental Association was held in Norfolk, September 25, 1908, and officers for the ensuing year were elected as follows: President, W. M. Condon, Madison; Vice-President, J. F. Daly, Wisner; Secretary, C. S. Parker, Norfolk; Treasurer, H. J. Cole, Norfolk.

SOUTHWESTERN TEXAS DENTAL ASSOCIATION.

The fourth annual meeting of the Southwestern Dental Association was held in San Antonio, October 10, 1908, and officers for the ensuing year were elected as follows: President, J. H. Graham, San Antonio; Vice-President, T. A. Anderson, Corpus Christi; Secretary-Treasurer, J. M. Cavender, San Antonio. The next meeting will be held in Austin.

DENTAL ASSOCIATION OF THE PROVINCE OF QUEBEC, CANADA.

The annual meeting of the Dental Association of the Province of Quebec was held in Montreal, September 26, 1908, and officers for the ensuing year were elected as follows: President, P. J. Berwick, Montreal; Vice-President, A. Landrier, Quebec; Secretary, Dr. Dubien, Montreal; Treasurer, C. F. Morrison, Montreal.

DUBUQUE DISTRICT DENTAL SOCIETY.

The annual meeting of the Dubuque District Dental Society was held in Dubuque, Iowa, September 22, 1908, in conjunction with the September meeting of the Dubuque County Dental Society, and the following officers were elected: President, J. F. Conover, Decorah; Vice-President, D. J.

Heisey, Dubuque; Secretary, W. J. Mullen, Dubuque; Treasurer, C. H. Jacobs, Colesburg. The next meeting will be held in Decorah.

FOX RIVER VALLEY (WIS.) DENTAL SOCIETY.

The annual meeting of the Fox River Valley Dental Society was held in Appleton, September 9, 1908, and officers for the ensuing year were elected as follows: President, J. L. Blish, Fond du Lac; Vice-President, H. K. Pratt, Appleton; Secretary, G. A. Stratton, Oshkosh; Treasurer, G. E. Johnston, Appleton. The next meeting will be held in Fond du Lac.

SOUTHERN ILLINOIS DENTAL SOCIETY.

The twenty-third annual meeting of the Southern Illinois Dental Society will be held in Greenville, on Tuesday and Wednesday, October 27 and 28. We hope that all interested in the welfare of this society will unite with us in our efforts to make this a banner meeting.

HARRY K. BARNETT, Secy.,
Upper Alton, Ill.

IOWA BOARD OF DENTAL EXAMINERS.

The Iowa State Board of Dental Examiners will hold its next examination at Iowa City, December 1, 1908, beginning at 9:00 a. m.

Practical examination in operative and prosthetic dentistry. All fees must be in the hands of the secretary by November 15.

E. D. BROWER, Secy.,
Le Mars, Iowa.

SEVENTH AND EIGHTH DISTRICTS DENTAL SOCIETY OF THE STATE OF NEW YORK.

A union meeting of the Seventh and Eighth Districts Dental Societies of New York will be held at the Hotel Seneca, Rochester, N. Y., on November 12, 13, 14, 1908. For further particulars address the secretary,

CLINTON W. LA SALLE,
Rochester, N. Y.

ILLINOIS STATE BOARD OF DENTAL EXAMINERS.

The annual meeting of the Illinois State Board of Dental Examiners for the examination of applicants for a license to practice dentistry in the state of Illinois will be held in Chicago, at the University of Illinois Dental Department, corner Honore and Harrison streets, beginning Monday, November 9, 1908, at 9 a. m.

Applicants must be in possession of the following requirements in order to be eligible to take the examination: (1) Any person who has been engaged in the actual, legal and lawful practice of dentistry or dental surgery in some other state or country for five consecutive years just prior to application; or (2) is a graduate of and has a diploma from the faculty

of a reputable dental college, school or dental department of a reputable university, or (3) is a graduate of and has a diploma from the faculty of a reputable medical college or medical department of a reputable university, and possesses the necessary qualifications prescribed by the board.

Candidates will be furnished with proper blanks and such other information as is necessary, on application to the secretary. All applications must be filed with the secretary five days prior to the date of examination. The examination fee is twenty ($20) dollars, with the additional fee of five ($5) dollars for a license.

Address all communications to

J. G. REID, Secy.,
1204 Trude Bldg., Chicago, Ill.

OHIO STATE DENTAL SOCIETY.

The forty-third annual meeting of the Ohio State Dental Society will convene in Columbus on December 1, 2 and 3, 1908, at the assembly rooms of the Great Southern Hotel.

The program of essays and clinics will be such as to afford instruction to all in the various phases of present-day practice.

Make your arrangements now to be present. Come and enjoy the benefits to be derived and renew old friendships.

F. R. CHAPMAN, Secy.,
305 Schultz Bldg., Columbus, O.

CONNECTICUT STATE DENTAL COMMISSIONERS.

The Dental Commissioners of the State of Connecticut hereby give notice that they will meet at Hartford, on Wednesday, Thursday and Friday, November 11, 12, and 13, to examine applicants for license to practice dentistry, and for the transaction of any other business proper to come before them.

On receipt of application blank filled in and sworn to and accompanied with fee of twenty-five ($25) dollars each applicant will be sent a number, which number will represent said applicant during the examination.

The practical examination will take place at Putnam Phalanx Armory, corner Haynes and Pearl streets, on Wednesday, November 11. All prosthetic pieces should be tagged with applicant's number and handed to the commissioners at 9 o'clock, Wednesday morning. Applicants whose numbers range from one to sixteen, inclusive, will be examined in operative dentistry at 10 a. m. Those whose numbers are above sixteen will be examined in operative dentistry at 2 p. m. All applicants whose credentials are accepted shall be entitled to take both the practical and the theoretical examinations. Credentials shall be examined at the Hotel Heubling, Tuesday evening, at 8:30, and at Putnam Phalanx Armory at 9 o'clock, Wednesday morning.

On Thursday, November 12, the theoretical examination will be held

from 9 to 11, 11:30 to 1:30 and 3:30 to 5:30. On Friday, November 13, from 9 to 11, and 11:30 to 1:30. Theoretical examination will be held at the State Capitol.

By order of the Commission.

GILBERT M. GRISWOLD, Recorder,
783 Main St., Hartford, Conn.

BRITISH SOCIETY FOR THE STUDY OF ORTHODONTIA.

The British Society for the Study of Orthodontia has appointed a committee to ascertain what work has been done up to the present by way of ascertaining the proportions of the different types of normal dental arches, and applying this knowledge to the treatment of actual cases in practice. It is thought that just as human skulls are classified according to the cephalic index, which is based on the measurements of length and breadth, so the study of dental arches, based also on anthropological methods, might be of great service as a basis for the more serious study of orthodontia. The society is, therefore, anxious to ascertain whether any measurements of normal arches have been made with this object in view, and will be grateful for any reference to papers which have been published on the subject in any language, or for the names of any who have been occupied in a research of this kind.

The committee would indicate the following as the points upon which they will be glad to have any specific information or statistics, either regarding the temporary or permanent arches:

1. Relation of length of arch to breadth: What were the methods of measurement, and what points were taken to measure between?

2. Relation of size of teeth to size of arch: What method of determining this correlation was adopted?

3. Height of palate: Points of measurement used to determine this?

Any information bearing on this subject, or reference to papers, will be gratefully received by—

G. G. CAMPION,
264 Oxford Road, Manchester, Eng.
H. CHAPMAN,
20 Queen Anne Street, London, W., Eng.
J. E. SPILLER,
62 Worple Road, Wimbledon, Eng.

LATEST DENTAL PATENTS.

897,160. Production of tooth cement, F. Schoenbeck, Leipzig, Germany.
897,171. Dental sterilizer and water-heater, E. G. Stamper, Paducah, Ky.
897,518. Artificial tooth mount, S. C. Bloom, Philadelphia, Pa.
898,546. Means for securing artificial dentures, E. S. Barnes, G. T. Williams and C. B. Reynolds, Seattle, Wash.
898,559. Dental bridge, C. E. Crombie, Minneapolis, Minn.

News Summary.

SYPHILIS.—Hughes discusses the diagnosis and treatment of syphilis, and urges the enactment of a law by Congress making compulsory castration for every male syphilitic, and ovariotomy for every female syphilitic. He would indorse a law prohibiting the landing of syphilitics in the United States.—*Jour. Amer. Med. Assn.*

SUICIDES.—D. Allen Morton, 34 years old, a prominent Brooklyn dentist, committed suicide at a sanitarium in Jay, N. Y., August 31, 1908, by shooting himself in the head. Despondency on account of health is given as the cause.—U. A. Dalton, 45 years old, a well-known dentist of Morrisville, N. Y., committed suicide by hanging, the latter part of September, 1908. A nervous disorder, following a severe attack of illness, was the cause.

DENTAL SCIENCE.—Dental science exists not for the dentist but for the people, and the most legitimate advancement of the dental profession is that which renders it more proficient in administering to the needs of the people. A man is ranked in respect to his professional life in accordance with the dignity of his calling and his proficiency in carrying out the highest ideals of that calling.—The late PROF. W. D. MILLER, *Dental Summary.*

VACUUM CHAMBERS UNNECESSARY.—If we simply think of the action of the air, we can readily see why the vacuum chamber is not practical. I am satisfied in my own mind that there never has been a vacuum chamber placed in a denture that ever did any good other than to afford more or less relief, which is not of any practical importance, when the periphery of the chamber does not extend beyond the hard area.—J. H. PROTHERO, *Dental Review.*

SODIUM HYDROXID FOR STERILIZING ROOT-CANALS.—For sterilizing root-canals, before inserting a filling, a 50 per cent solution of caustic soda may be applied. Care is to be taken that the soda solution does not come into contact with the gingivæ or the lips, on account of its strong caustic action. It is not necessary to dry with hot air; the canals are simply cleaned with cotton saturated in alcohol, afterward with chloroform.—*Dental Cosmos.*

WATER CAUSES THE CHANGE OF FORM IN INVESTMENTS.—Take an investment, and it has a certain amount of plaster in it, not much water, and at the end of, say, ten minutes it begins to set. Because the chemical affinities of that plaster have not been thoroughly satisfied, the moisture that is still in there would go on and change the chemical process of the setting of that plaster until tomorrow, when you would have a differently shaped mass from what you had today. As soon as that mass has hardened by heating it you drive away the excess of moisture, which would have a tendency by tomorrow morning or the middle of the next day to change

its shape. By doing so, you have driven out the moisture, and the result is an investment which is not going to change its proper form. All along these lines you should start in and work, and bring the results of your labors before the profession.—WILLIAM H. TAGGART, *Dental Review.*

EXAMINING BOARD AFFAIRS.—Governor Gillett of California has reappointed Drs. C. A. Herrick of San Francisco and J. W. Neblett of Riverside members of the State Dental Board.—Governor Crawford of South Dakota has appointed Dr. E. E. Field of Sioux Falls a member of the State Dental Board for a term of five years.—The Governor of New Jersey has reappointed Dr. Alphonse Irwin of Camden a member of the state board for a term of five years.

ILLEGAL PRACTITIONERS.—The Supreme Court of California, October 9, sustained the action of Judge Samuels of Oakland, in finding a dentist of that city guilty of violating the law relative to the practice of dentistry, in which a fine of $50 was imposed.—A dentist of Covington, Ind., was fined $25 and costs, September 25, for practicing without the necessary license.—A dentist of Brooklyn was fined $50 September 29, and a dentist of Toledo the same amount, September 24, for practicing without licenses.

COVER FOR TABLE.—The use of white sheet celluloid as a bracket table cover has proved so satisfactory to me that I have thought it worth while mentioning it. I get the thin sheet celluloid (white) at an artists' supply store, selecting the proper dimensions, and fasten it in place with thumb tacks. It is not as noisy as glass, and will not permit the catching fast of an instrument when picking one up. It is easily wiped off with moist cloth at the end of each operation while instruments are being cleansed for the next.—GRAFTON MONROE, *Dental Review.*

THE MATRIX.—The matrix should be used always in proximal cavities in the posterior teeth, whether the filling is gold or amalgam. You can pack your material much better, get a denser filling, contour it better, keep it away from the gum margin, and the filling is half polished when you remove the matrix. Particularly is this true with amalgam; the tendency is to pack the interproximal space full of the material, and I regret to say that this is many times left, resulting when hard in a constant irritation to the gum margin.—W. E. TENNANT, *Dental Review.*

"NON-MEDICAL HEALING!"—Probably no more focible *reductio ad absurdam* of the current view as to what inherently constitutes the practice of medicine, could be conceived by the witlessness of man than House Bill No. 704, now before the General Assembly of the State of Ohio, entitled "A Bill to Regulate the Practice of Non-Medical Healing in the State of Ohio." Non-medical healing, forsooth! Why not a bill to authorize the non-judicial practice of law, or to establish non-sanitary boards of public health? Why not establish in the curricula of our state schools and universities courses for the teaching of non-theological divinity, of the non-biologic study of life, or the non-linguistic study of languages? We can hardly imagine that any legislature will so far stultify itself as not to

resent the insult cast on its common intelligence by the very title of such a bill. If a bill of this nature must be presented, let it at least be correctly described as what it is—a bill to authorize the practice of healing without requiring proof of acquaintance with those basic truths and principles on which the safe application of any healing measure whatsoever must for all time inseparably depend.—EDITORIAL, *Journal Amer. Med. Assn.*

DENTAL SOCIETY DISBANDS.—After an existence of twenty-five years, the First District Dental Society of Illinois became defunct yesterday afternoon, when, by the unanimous vote of the few members in attendance, it was decided to disband. It was stated that the aims and objects of the organization were more fully represented in other associations, so that the district organization had become superfluous. Its place will be taken by the Peoria County Dental Society, of which a number of dentists in adjacent counties will become members.—Peoria, Ill., *Star.*

DEAN OF ST. LOUIS DENTISTS BANQUETED.—To mark the fiftieth anniversary of Dr. George A. Bowman's practice of dentistry, the St. Louis Society of Dental Science, of which he is president, gave him a dinner on the evening of October 8. Dr. Edward E. Haverstick was toastmaster, and speeches were made by Doctors Herman Cassell, A. H. Fuller, E. P. Dameron, Frank O. Hetrick of Ottawa, Kan., Charles L. Hungerford and John D. Patterson, both of Kansas City. Dr. Burton Lee Thorpe presented Dr. Bowman with a cut-glass loving cup on behalf of the diners.

TO CLEAN BURS.—An excellent method of cleaning burs without impairing their sharpness by the use of a wire brush is to lay them for a few hours in a saturated solution of sodium carbonate. Every bur that is to be used again is, immediately after using, laid in a glass tray with soda water. The burs are easily cleaned by mere wiping or brushing with a nail-brush, whereas even boiling would not free them from all particles of dirt. Subsequent sterilization must, of course, not be omitted. Instruments immersed in soda water do not rust.—MULLER-STADE, *Dental Cosmos.*

FATALITIES.—Andrew Hagberg, 56 years old, of Chicago, died October 3, as the result of having a tooth extracted two weeks previous. Septicemia set in after the tooth had been extracted, and physicians were unable to save his life.—Mrs. Arthur Walters, 25 years old, of Belvidere, N. J., died October 13, of lockjaw. Four days previous she had four teeth drawn; later she became ill and died. It is said her illness was due to the anesthetic she took.—Mrs. U. P. Atkins of Warren, Pa., died October 8 in a dentist's chair as the result of taking chloroform.—Mrs. Anna Donovan, 28 years old, of St. Louis, Mo., died in the office of a dentist, September 6. A drug administered to deaden the pain of having a tooth extracted affected her heart.—Ellen Kelly, a 7-year-old girl of Brooklyn, N. Y., died September 23, death being indirectly due to the extraction of a tooth two weeks previous.—Gilbert Parker, 9 years old, of Nacogdoches, Tex., died October 9 from blood poisoning, caused by

pulling a tooth with rusty forceps.—Mrs. C. C. Smith, 24 years old, of Oklahoma City, Okla., died September 29 as a result of the extraction of decayed teeth, too long neglected, which produced septicemia.—Miss Elizabeth Nicol, 17 years old, of Marysville, O., died September 19, after a few days' illness, of peritonitis, which was caused by an abscessed tooth.

LENGTH OF TIME A PLATE SHOULD BE WORN.—Generally speaking, plates should not be worn over five or six years. Oftentimes a patient will wear a plate too long after the ridge has absorbed away, and the edge of the plate has cut a series of grooves and the soft tissue will hang in flaps under the lip. These flaps should be cut away, the rim of the old plate cut down and covered with antiseptic gauze to keep the freshened surfaces of the lip and ridge from healing together; and in two weeks a plate may be made which will be comfortable and useful.—J. A. BULLARD, *Dental Review.*

COMPARISON OF THE INFLUENCE OF FATHER AND MOTHER IN RESPECT TO TRANSMISSION OF SYPHILIS TO THE OFFSPRING.—Carle believes that syphilis in the mother is far more dangerous for the offspring than syphilis in the father, and relates three instances in which young men marrying, 13, 18 and 9 months after the primary sore, in the midst of the second stage, did not contaminate the wife, and have procreated healthy offspring. He consequently insists on greater strictness in regard to the interval before permitting marriage in the case of women than of men.—*Jour. Amer. Med. Assn.*

TAKING A PLASTER IMPRESSION.—There is frequently a condition of engorged circulation that it is well for the operator to take in hand, and in doing that, I think it would be a practical plan to have the patient take a large saline cathartic before breakfast, better four or five hours before the impression is taken, and then take the impression twice. The first impression will act as an astringent and absorb a large amount of moisture from the soft tissues of the mouth, and reduce the size of the mouth, and the second impression will be a much closer fit.—D. R. PHILLIPS, *Dental Review.*

THE "PEOPLE'S DISEASE."—By this apt name Woodbury refers to dental caries, which is undoubtedly the most widely distributed disease in the world. He quotes Osler's saying: "If I were asked to say whether more physical deterioration is produced by alcohol or by defective teeth, I should unhesitatingly say, defective teeth." The author discusses the condition of the mouth from babyhood on. He suggests the union of the Boston dental organizations, with a view to aiding in popular education as regards oral hygiene by the following methods: 1. Putting into wider circulation the leaflet on the "Care and Use of the Teeth." 2. Furnishing literature on dental hygiene, and information and assistance in promoting the cause. 3. Providing popular exhibitions—charts, photographs, instructions, literature—for settlements, schools and institutions. 4. Giving practical talks on the care of the teeth, and popular and timely articles to the newspapers—

country and city. 5. Co-operating with the organizations working to check and control tuberculosis. 6. Providing lists of registered skilled dentists who will work for nominal fees for deserving and worthy persons. 7. Discouraging the sale and use of dental preparations injurious to the teeth. —*Jour. Amer. Med. Assn.*

THE PATIENT'S CONFIDENCE.—It is impossible to write out a formula of conduct and attainment that will insure success in the acquirement and permanent possession of the confidences of patients and their friends. There are unlettered physicians and dentists exercising unethical conduct toward both patients and fellow practitioners who acquire easily and hold strangely enough the unwavering faith of a large patronage, but these are very few in number. The explanation of the success of such men is business acumen and strong personality to inspire and retain confidence along with the doing of many things necessary and unnecessary.—*Leucocyte.*

SHAPING WAX MODEL FOR CERTAIN CAST GOLD INLAYS.—I have found the following of great value in shaping the wax model for certain cast gold inlays: In compound proximal cavities in bicuspids and molars I adjust the medium soft wax to approximate contour and bulk. Then I stretch a strip of rubber dam one-half inch by two inches over it and against it, holding the ends taut with the left hand. Pressed against the cavity by the rubber dam, the wax is easily burnished to exact proximal contour, occlusal contact and smooth surface. I then remove the rubber dam, invest and cast as usual.—C. EDSON ABBOTT, *Dental Summary.*

PREVENTION OF PUTREFACTION.—In considering all of the factors that enter into the prevention of putrefaction and permanently arrest the activities of the bacterial cell process upon dead organic substance, through the agents used as antiseptics and disinfectants, one of the striking differences in the decomposition process is whether the decomposing mass is confined in vitro, or whether the mass is confined in a pulpless tooth, in which the apical end of the root has been sealed. For instance, it requires a great deal more of the agents to arrest the decomposition in the tooth than it does in the test tube.—GEORGE W. COOK, *Dental Review.*

IS DENTISTRY FREE FROM THE FOLLOWING ATTACK ON MEDICINE? GOOD WAY TO COMBAT QUACKERY.—That the fight against quackery is hindered by the fact that a number of low-grade medical colleges are still allowed to exist is shown by the following, taken from a paragraph entitled "Half-Baked Doctors," in the Kansas City *Newsbook*: "Every fight against quackery is weakened by the fact that a large majority of regular physicians are not much better qualified than the charlatans, and are only superior to them in that they do not advertise horrible lies. The quacks realize this and use it vigorously in defense of themselves. And the people, appreciating the truth of the charge, shrug their shoulders and mutter about it being six of one and half a dozen of the other. Until the medical profession frees itself from incompetency it will always be hard for it to attack the evil of charlatanry. And the sooner they get about it the better."

There is a large element of truth in the above. While it is an exaggeration to say that "a large majority of regular physicians are not much better qualified than the charlatans," the statement would be true if limited to the graduates of some schools. There are so-called medical colleges in Chicago, not to mention other places, that are little better than diploma mills, and so long as such are tolerated by licensing boards, so long will lay journals be excusable in making such statements as we have quoted.—*Jour. Amer. Med. Assn.*

Conditions Necessary to Retain a Plate in the Mouth.—The conditions necessary to retain a plate in the mouth are close adaptation of the plate to the soft tissues, relief in the palatine or other portions to prevent undue pressure on the hard areas, and proper anatomic occlusion of the teeth so that the plates will not tip under the stress of mastication. This is accomplished by securing the three-point contact. The viscosity of the mucus and atmospheric pressure are important agents in retention. The tongue and cheek muscles, acting as a pump, practically make a partial vacuum of the entire palatine portion of the plate.—H. F. Methven, *Dental Review.*

Cranial Sinus Skiagraphy.—In examining the frontal sinus, antrum and ethmoidal and sphenoidal cells, Tousey takes first a lateral view of the face, and secondly an anteroposterior picture with the tube behind the head and the plate in front. He describes a method of taking the pictures from an empty skull, in which the different air spaces are filled with lead shot, for comparison with pictures showing the condition of these air spaces in living patients. Anteroposterior pictures of the head seldom show as well in print as in the original print or negative, which is best examined by transmitted light in a negative examining box.—*Jour. Amer. Med. Assn.*

Robberies.—Every dental office of Redding, Cal., was visited by burglars the night of September 29; three of them were robbed of gold, the total losses figuring more than $165.—Dr. F. H. Albright, Red Bluff, Cal., gold valued at $60, October 2.—Drs. Granger, Angle and McMaster, Belvidere, Ill., gold valued at $100, September 20.—Dr. Fred G. Miller, Aurora, Ill., gold valued at $2, September 30.—Drs. J. Q. and Richard Neptune, Decatur, Ind., gold valued at $50, September 21.—Dr. G. L. Smith, Hammond, Ind., gold valued at $50, September 26.—Dr. Haydon Grayson and Dr. Otto King, Huntington, Ind., a quantity of gold, September 20.—Dr. Harry Gregg, Marion, Ind., gold valued at $50, September 23.—Dr. B. F. Kirk, Detroit, Mich., gold valued at $34, September 22.—Dr. C. V. Carpenter and Dr. B. Masselink, Kalamazoo, Mich., gold valued at $25 and $10, September 1.—Dr. E. T. Comstock, Tonawanda, N. Y., gold valued at $40, September 20.—Dr. H. W. LeGalley, Bowling Green, O., gold valued at $35, October 2.—Dr. S. E. Starr, Toledo, O., gold valued at $40, September 14.—Drs. L. G. Corzilius and A. R. Hengst, Columbus, O., gold valued at $50, October 12.—Dr. J. C. Gories, Springfield, O., gold valued at $94,

in September.—Dr. A. G. Able, Allentown, Pa., gold valued at $100, September 25.—Dr. Frank P. Duffy, Riverpoint, R. I., gold valued at $85, in September.—Dr. C. C. Devereaux, Janesville, Wis., gold and bridge work valued at $75, September 9.—Dr. S. A. Bowman, New Castle, Pa., gold valued at $5, diamond pin, $100 and clothing.

PREPARATION OF A PLASTER IMPRESSION.—Immediately after the impression has been taken it should be scraped when we find hard places in the mouth. I prefer coating the rim of the impression with shellac, and brushing the part to be covered by the plate with soap and water just before pouring the plaster for the model. As soon as the plaster hardens, the impression cup should be removed to prevent as much as possible the bulging of the palatal portion of the impression and model. The model, after having been separated, should be trimmed where we want the plate to seat itself more deeply into the tissue, the amount depending on the kind of a plate to be made.—L. K. STEWART, *Dental Review.*

ARISTOL IN DENTAL PRACTICE.—Aristol is not intended for internal use. Aside from its great usefulness as a dressing in root-canals preparatory to the final filling operation, its distinctive virtues are plainly shown by taking a pledgét of cotton incorporated with either the dry powder or a strong solution of the antiseptic and packing it between the teeth with the object of separating them. On its removal a day or two afterward there will be none of the usual vapor proceeding therefrom to offend the most cultured Schneiderian membrane. The integrity of the insoluble antiseptic remains, preventing the putrefactive ferments which are there from getting in their usual work. Similar means may be employed instead of such nearly useless things as sandarac varnish, etc., to safely seal a cavity with an exposed pulp against the evil influence of arsenic trioxid to neighboring tissues.—J. S. CASSIDY, *Dentist's Magazine.*

MARRIAGES.—George W. Randall, a dentist of West Blockton, Ala., was married to Miss Carrie L. White of Nashville, Tenn., September 23.—John R. Bunch, a dentist of St. Louis, was married to Miss Josie Burnett of Leansboro, Ill., September 14.—C. B. Meek, a dentist of Chicago, was married to Miss Arvilla Weart of Peoria, Ill., October 5.—C. R. Weir, a dentist of Cumberland, Ia., was married to Miss Elizabeth Daly of Atlantic, Ia., September 23.—George M. Barrell, a dentist of Kansas City, Mo., was married to Miss Dora Gillespie of Galena, Kan., October 8.—William C. O'Sullivan, a dentist of Lewiston, Me., was married to Miss Jane A. Burns of Biddeford, in September.—Winfield S. Garland, a dentist of Brockton, Mass., was married to Miss Maud C. Hartwell of Newton, September 19.—William H. Weston, a dentist of Cambridge, Mass., was married to Miss Annabelle E. Reed of South Framingham, September 30.—Ottowell C. Howson, a dentist of Kalamazoo, Mich., was married to Miss Florence Britton, also of Kalamazoo, October 8.—Carlisle Taylor, a dentist of Sedalia, Mo., was married to Miss Mabel Berry of Speed, October 7.—Frank S. Wells, a dentist of Plainfield, N. J., was married

to Miss Anna T. Wooden, also of Plainfield, September 18.—H. W. March, a dentist of Canton, O., was married to Miss Catherine L. Zirhut, also of Canton, September 8.—J. H. Quinn, a dentist of Pryor Creek, Okla., was married to Miss Mabel Henry, also of Pryor Creek, September 11.—O. E. Imeg, a dentist of Sheboygan Falls, Wis., was married to Miss Esther Halverson, also of Sheboygan Falls, September 5.

CHICAGO DENTISTS HONOR DR. E. J. PERRY.—Dr. E. J. Perry, after a continuous practice of 39 years in Chicago and the state of Illinois, has decided to retire from practice and move to Idaho, where he will engage in farming. On Saturday evening, September 12, about 75 of his friends gathered at the Stratford Hotel to attend a banquet given in his honor. Several speeches were made in which the speakers referred to the record of Dr. Perry and the influence it had on dentistry in this state, all regretting to see him leave and wishing him Godspeed in his new undertaking. A beautifully embossed set of resolutions was presented to Dr. Perry, and he responded in his usual delightful manner, showing that optimism which has characterized him in all his work.

BE OPTIMISTIC.—I want to say, in a general way, that the world is full of faults. It is full of difficulties and defects. It is full of imperfections. You can find them everywhere. You can find them in your house; you can find them in the church; you can find them in the legislature and in Congress. Notwithstanding all that, it is an optimistic world and entitled to be considered so, and what I want to get at is this. It is so easy to find something that is not right, and the temptation to do so is so great that almost every one of us ought to make it an invariable rule never to complain of anything unless we, at the same time, can suggest some betterment for it. Let us not get uncomfortably warm about the things that are not right unless we can see some way to make them a little better.—E. NOYES, *Dental Review.*

DENTAL CARIES.—Baker urges the control of dental diseases as an important factor in preventive medicine. He describes carious cavities as culture tubes, containing stock cultures for the development of millions of disease-producing germs, which continually drain further into both the alimentary and respiratory tracts. The constant swallowing of poisonous material is the cause of many grave and far-reaching diseases, such as gastric catarrh, appendicitis and anemia. He cites such authorities as Sir Frederick Treves, Dr. William Hunter and Professor Osler, as to the lack of oral asepsis poisoning the fount of life from its very source. The prevention of dental caries would effect a great financial saving and be a step in preventive medicine. The physician, the surgeon and the dentist must collaborate in the education of the public, which is the most important step in every branch of preventive medicine. Dentists for hospital staffs, dental instruction to nurses, and dental as well as other inspection of public schools, are measures urged by this author.—*Jour. Amer. Med. Assn.*